Title

Flood Assessment at the Area 5 Radioactive Waste Management Site & The Proposed Hazardous Waste Storage unit, DOE/NTS, Nye County, NV Study of 100-Year Flood Hazard

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Flood Assessment at the Area 5 Radioactive

REVIEW DRAFT

FLOOD ASSESSMENT AT THE AREA 5 RADIOACTIVE WASTE MANAGEMENT SITE AND THE PROPOSED HAZARDOUS WASTE STORAGE

DOE/NEVADA

APPROVALS

FLOOD ASSESSMENT AT THE AREA 5 RADIOACTIVE WASTE MANAGEMENT SITE AND THE PROPOSED HAZARDOUS WASTE STORAGE UNIT DOE/NEVADA TEST SITE, NYE COUNTY, NEVADA	
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FLOOD ASSESSMENT

EXECUTIVE SUMMARY

A flood assessment at the Radioactive Waste Management Site (RWMS) and the proposed Hazardous Waste Storage Unit (HWSU) in Area 5 of the Nevada Test Site (NTS) was performed to determine the 100-year flood hazard at these facilities. No previous flood studies of these facilities delineated the 100-year flood hazard. This current study was conducted to determine whether the RWMS and the proposed HWSU are located within a 100-year flood hazard as defined by the Federal Emergency Management Agency (FEMA), and to provide discharges for the design of flood protection.

The overall watershed which could impact the RWMS and the proposed HWSU is approximately 140-square miles. This watershed was divided into 16 subbasins to best represent the hydrology of the study area. United States Geologic Survey (USGS) topographic maps were used to divide the drainage area into subbasins ranging in size from 0.3-square miles to 81.3-square miles. Barren Wash, Scarp Canyon, and Halfpint alluvial fans were delineated. These fans are characterized by incised channels in the upper parts of the fans decreasing to sheetflow in lower parts of the fan.

The 2-year, 10-year, and 100-year discharges were determined using methods and guidelines provided in the Clark County Regional Flood Control District (CCRFCD) *Hydrologic Criteria and Drainage Manual, 1990*. The methodology in the CCRFCD Manual was developed specifically for Southern Nevada by Clark County and the U.S. Army Corps of Engineers, Los Angeles District, and is the most current and region-specific approach to develop discharges. Flood studies conducted in Clark County following the methods provided in the CCRFCD Manual have been accepted by FEMA. The proximity of Area 5 to Clark County and their similar physical and climatic characteristics support the use of this region-specific method as the means of generating discharges for the study area.

As directed in CCRFCD Manual, the HEC-1 rainfall-runoff model developed by the U.S. Army Corps of Engineers was used to generate discharges for the RWMS and the proposed HWSU areas. Hydrologic models were developed for the 2-year, 10-year, and 100-year discharges. Point precipitation values used in this model were taken from NOAA Atlas 2, Volume VII. Field observations were made to determine the vegetation type and cover density, Manning roughness coefficient, slope, channel geometry, and concentration point locations. From this information, curve numbers (a method to quantify precipitation losses) and lag times for each of the subbasins were determined, routing parameters were applied, and discharges

potential flow obstructions and diversions, fan surface slopes, Manning roughness coefficients, single-channel versus multiple-channel regions, and the 2-year, 10-year, and 100-year discharges from the hydrologic analysis. This information was gathered from studies of available topographic and surficial geologic maps and intensive field investigations. The results of the alluvial fan analyses are shown on the maps included in this document.

Part of the RWMS is located within the 100-year flood hazard on the Barren Wash Alluvial Fan. The southwest corner of the RWMS is within the Zone AO of the Barren Wash Alluvial Fan. (This part of the RWMS does not include RCRA units covered in the RCRA Part B Permit Application.) FEMA designates alluvial fan flooding, shallow concentrated flow, and sheetflow areas with 100-year flood depths between 1 and 3 feet as Zone AO. FEMA further designates an associated flow velocity for alluvial fan flood hazards.

The HEC-2 model developed by the U.S. Army Corps of Engineers to determine water surface elevations in channels was used to assess the flood hazard of shallow concentrated flow in a channel impacting the southwest corner of the RWMS. This analysis determined that flows exceed a depth of 1 foot along the southwest corner of the RWMS, which places this part of the RWMS in the AO zone.

For the remaining subbasins that could impact the RWMS and the proposed HWSU, flood hazard determinations were conducted assuming sheetflow conditions. This analysis, using FEMA methodology for sheetflow, concluded that depths of flow during the 100-year flow event were less than 1 foot. Thus, the RWMS and the proposed HWSU are not in a 100-year flood hazard as defined by FEMA.

Although the RWMS and the proposed HWSU facilities that are included in the RCRA Part B Permit Application are not within a 100-year flood hazard per FEMA definition (100-year flood depth at or greater than 1 foot), flow from a 100-year event could impact the facilities. Flood protection requirements are being evaluated.

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1.0 INTRODUCTION

1.1 Location

A flood assessment was conducted at the Radioactive Waste Management Site (RWMS) and the proposed Hazardous Waste Storage Unit (HWSU) in Area 5 of the Nevada Test Site (NTS) in Nye County, Nevada (Figure 1). In this report, the RWMS includes the Transuranic (TRU) Radioactive pad, Mixed-Waste Disposal Unit, and Pit 3 within the RWMS. The study area encompasses portions of the Massachusetts Mountains, the Halfpint Range, and the drainages of Barren Wash and Scarp Canyon.

1.2 Purpose

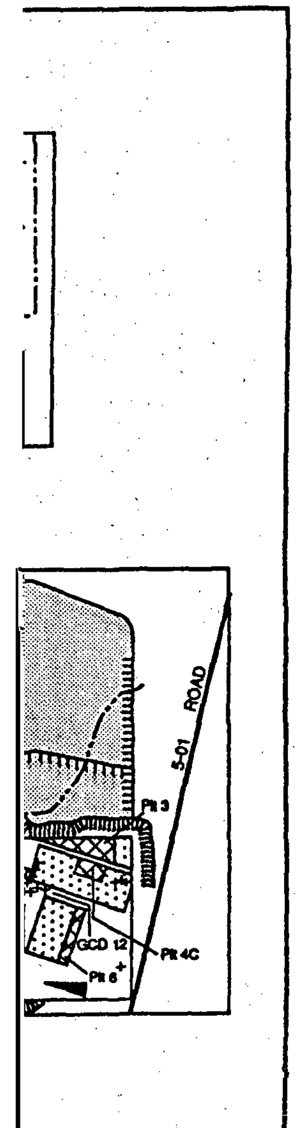
Flood assessment is one of the subtasks related to surficial geology studies at and near the RWMS. Surficial geology studies respond primarily to requirements and guidelines for site characterization found in federal regulations. The principal federal regulations and criteria pertaining to flooding with which the RWMS must comply are:

- Executive Order 11988 (*Floodplain Management*),
- 10 CFR 61.50 (*Technical Requirements for Land Disposal Facilities*),
- 40 CFR 264.18 (*Location Standards for Hazardous Waste Management Facility*),
- 40 CFR 270.14 (*General Requirements for a Hazardous Waste Facility*), and
- Department of Energy (DOE)/Nevada-341, *Environmental Compliance Handbook, September 1990.*

The RWMS must also comply with Nevada Administrative Code 444.8456 (*Restrictions on Locations of Stationary Facilities for Management of Hazardous Waste; Exceptions*). These regulations prohibit the placement of a hazardous waste facility in a 100-year floodplain. This subtask focuses on the potential 100-year flood hazard on the RWMS. Although the flood assessment subtask does not evaluate the erosion hazard over a geologic time scale (10,000 years), as required under 40 CFR 191.13 (*Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level, and Transuranic Radioactive Waste; Final Rule*), other subtasks are being conducted to gather information regarding erosion on the RWMS. These subtasks include detailed trench and surface mapping, alluvial structure, and seismic fault definitions.

1.3 Objective

The objective of this flood assessment was to determine the 100-year flood hazard on and near the Area 5 RWMS using the most site-specific and applicable approaches for the hydrologic and hydraulic analyses. This flood assessment was conducted to provide hydrologic and hydraulic information for flood protection design and to follow the criteria for flood hazard determination required by the Federal Emergency Management Agency (FEMA), as specified in 40 CFR 270.14.



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1.4 Previous Studies

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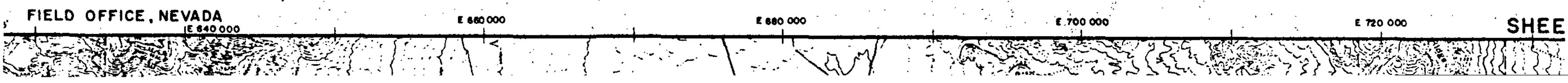

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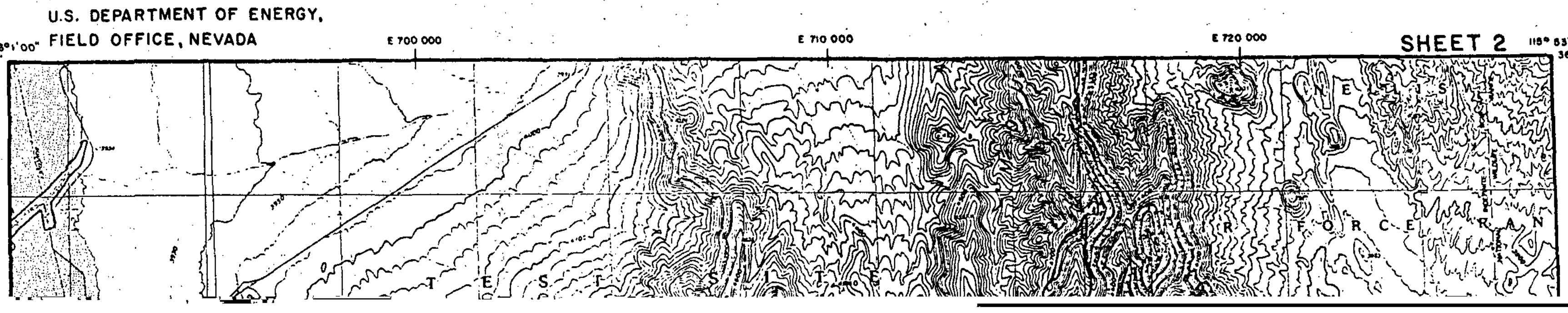
SHEET 2



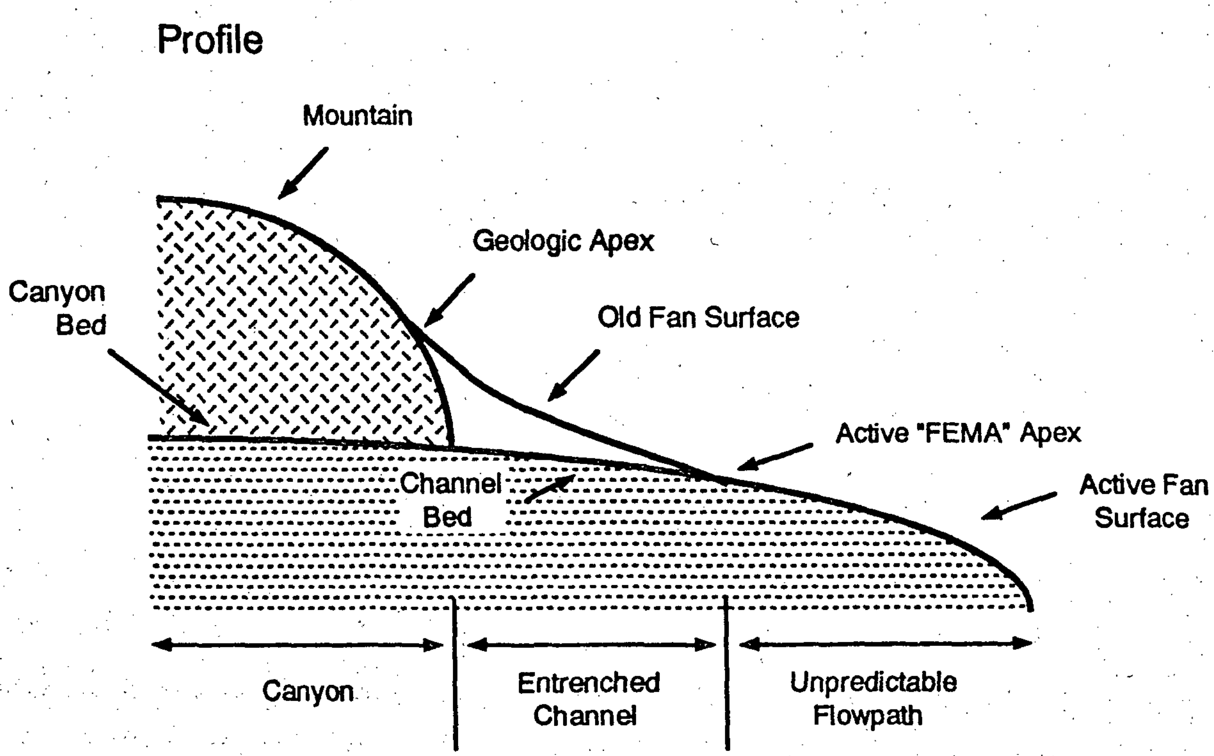


Figure 4. Idealized Alluvial Fan Profile (modified from French, 1989). The geologic apex is the intersection of the mountain front and the piedmont plain. The active "FEMA" apex is the point below which the flow of the main channel becomes unpredictable.

The Barren Wash Alluvial Fan is the dominant landform in the watershed. The proximal part of the fan (the area on the alluvial fan near the apex) is deeply entrenched by a stream channel. Significant parts of the fan surface are covered by desert pavement with desert varnish, and vegetation covers 15 to 25 percent of the surface. Erosion is the primary geomorphological process occurring on the proximal part of the fan, as shown by scalloping of the fanhead trench.

Continued trench incision has shifted deposition to a distal part of the fan (the outermost area, or lower zone of the fan). The Barren Wash channel captures the channel draining from the Massachusetts Mountains 1A (MM1A) subbasin at the southwestern corner of the Massachusetts Mountains (*Figure 3* and *Sheet 2*). At this point a new, secondary fan is being formed which extends east toward the RWMS and south to Frenchman Flat. The RWMS is located on the lower-mid part of this secondary fan.

2.4 Scarp Canyon Alluvial Fan

The Scarp Canyon watershed, located northeast and east of the RWMS, covers about 40.9-square miles (*Figure 2* and *Sheet 1*). This watershed drains onto Scarp Canyon Alluvial Fan from an area that extends north to Carbonate Ridge (French and Lombardo, 1984), west to the Massachusetts Mountains, and east to Raysonde Butte. The watershed is divided into two subbasins: Scarp Canyon 1 (SC1, 39.4-square miles), the drainage area above the active apex; and Scarp Canyon 2 (SC2, 1.5-square miles), the area between the channel that drains SC1 and the eastern boundary of Halfpint Alluvial Fan (*Figure 3* and *Sheet 2*).

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alluvium and bedrock above the active apex. Below the active apex, the channel cuts through unconsolidated and calcrete-cemented alluvium. Parts of the fan surface are covered by desert pavement with desert varnish. Vegetation density is 15 to 25 percent over the fan surface.

2.6 Massachusetts Mountains/Halfpint Range Subbasins

the CCRFCD Manual were considered the best approach for estimating discharges for the flood assessment of the RWMS and vicinity for these reasons:

a. The physical setting and flood-producing storms for the RWMS and vicinity are similar to those of Clark County;

b. The eastern boundary of the study area is adjacent to the Clark County line;

c. Local and federal agencies (e.g., FEMA) accept the methods in the CCRFCD Manual; and,

d. Clark County is the nearest local jurisdiction with a hydrologic method based on region-specific information.

The Soil Conservation Service (SCS) unit hydrograph option in the HEC-1 computer program was used in the hydrologic models. The SCS unit hydrograph is widely used in rainfall-runoff models and is recommended as an option in the CCRFCD Manual. The input parameters required to run the HEC-1 computer model using the SCS unit hydrograph option are:

- precipitation parameters (depth of precipitation, storm duration and time distribution, and depth-area ratios);
- drainage area (total drainage area and subbasins);
- precipitation losses (curve numbers);
- lag time for each basin; and,
- channel routing parameters.

The procedure used to obtain these parameters generally followed the methods described in the CCRFCD Manual. The following sections provide an overview of how these parameters were determined and substantiate any deviations from the methods provided in the CCRFCD Manual. A detailed description of how these parameters are determined is in the CCRFCD Manual.

3.1.1 *Precipitation*

Rainfall events that cause flooding on the NTS and in southern Nevada are usually convectional storms. According to Christenson and Spahr (1980), the probable flood-generating storm in the NTS area would be from summer convectional storms. These flood-producing storms are normally characterized as short-duration (6-hours or less), high-intensity storms over a localized area. Methods regarding precipitation parameters in the CCRFCD Manual assume that summer convectional storms are the likely precipitation event to produce flooding in Clark County. In an analysis of precipitation records for southern Nevada, WRC Engineering and the COE determined that a 6-hour rainfall should be the design storm. A 6-hour mass curve (intensity of rainfall per 15-minute intervals over the 6-hour design storm) was developed and a relationship between precipitation depth and storm size (depth-area ratios) was determined. These parameters are discussed below in more detail.

a. Point Precipitation Values

As specified in the CCRFCD Manual, the design depths of precipitation for the 6-hour storm were taken from NOAA Atlas 2, Volume VII (1973) and are listed in Table 1.

Table 1. Six-Hour Storm Point Precipitation Values and Correction Factors (CCRFCD Manual, 1990). Correction factors used to adjust precipitation values for design depths of precipitation for the six-hour storm.

	NOAA Values	Correction Factor	Corrected Point Rainfall (inches)
2-Year, 6-Hour	0.70	1.00	0.70
10-Year, 6-Hour	1.10	1.24	1.36
100-Year, 6-Hour	1.60	1.43	2.43

The 100-year, 6-hour point precipitation value of 1.6-inches (NOAA Atlas 2, Volume VII, 1973) compares well with the 1.8-inch value generated from a figure developed by French (1983) for the Cane Springs precipitation gauge (Figure 5). The preliminary value of 2.6-inches for the 100-year, 24-hour storm taken from a statistical analysis of the rainfall data at Well 5b (*Figure 5*) by Reynolds Electrical & Engineering Co., Inc., (Barker [personal communication], 1992). This rainfall data compares well with the values listed in NOAA Atlas 2, Volume VII (1973). Locations of these gauges are shown on *Figure 2* and *Sheet 1*.

The CCRFCD Manual requires that the point precipitation values listed in NOAA Atlas 2, Volume VII (1973) be used to determine point precipitation; however, the CCRFCD Manual specifies that rainfall events above the 2-year storm be adjusted. *Table 1* shows the correction factors listed in the CCRFCD Manual. These correction factors were identified from studies conducted by WRC Engineering and COE for Clark County (CCRFCD Manual, 1990) based on available rainfall data, primarily from the Las Vegas Valley, so these factors may not be applicable for the RWMS study area.

French (1983) hypothesized that the southern part of Nevada can be divided into three precipitation zones: an excess zone, a transition zone, and a deficient zone (Figure 6). French (1983) indicates that the Las Vegas Valley is located in the excess zone, and the NTS is located in the transition zone. He further hypothesizes that the excess zone is a result of storms tracking up the Colorado River Valley, and the influence of the river on precipitation values lessens with distance away from the Colorado River Valley. The precipitation analysis by French (1983) and Barker (personal communication, 1992) support this hypothesis and suggest that the noncorrected precipitation values for the RWMS study area are more applicable than using the precipitation correction factors specified in the CCRFCD Manual. Hydrologic models in this flood assessment used the nonadjusted values in NOAA Atlas 2, Volume VII (1973); however, a discharge model was developed using the correction factors specified in the CCRFCD Manual to compare with the hydrologic models developed without the adjustment factors. The results of this comparison are discussed in Section 3.4, *Hydrology Discussion*.

b. Storm Duration and Time Distribution

Clark County has adopted two 6-hour storm distribution tables to be used to generate discharges (CCRFCD Manual, 1990). The two storm distributions defined in this manual are for areas less than or larger than 10-square miles. These storm distributions were used for the subbasins in the hydrologic models for the RWMS. A mass curve of the two storm distributions is shown in Figure 7.

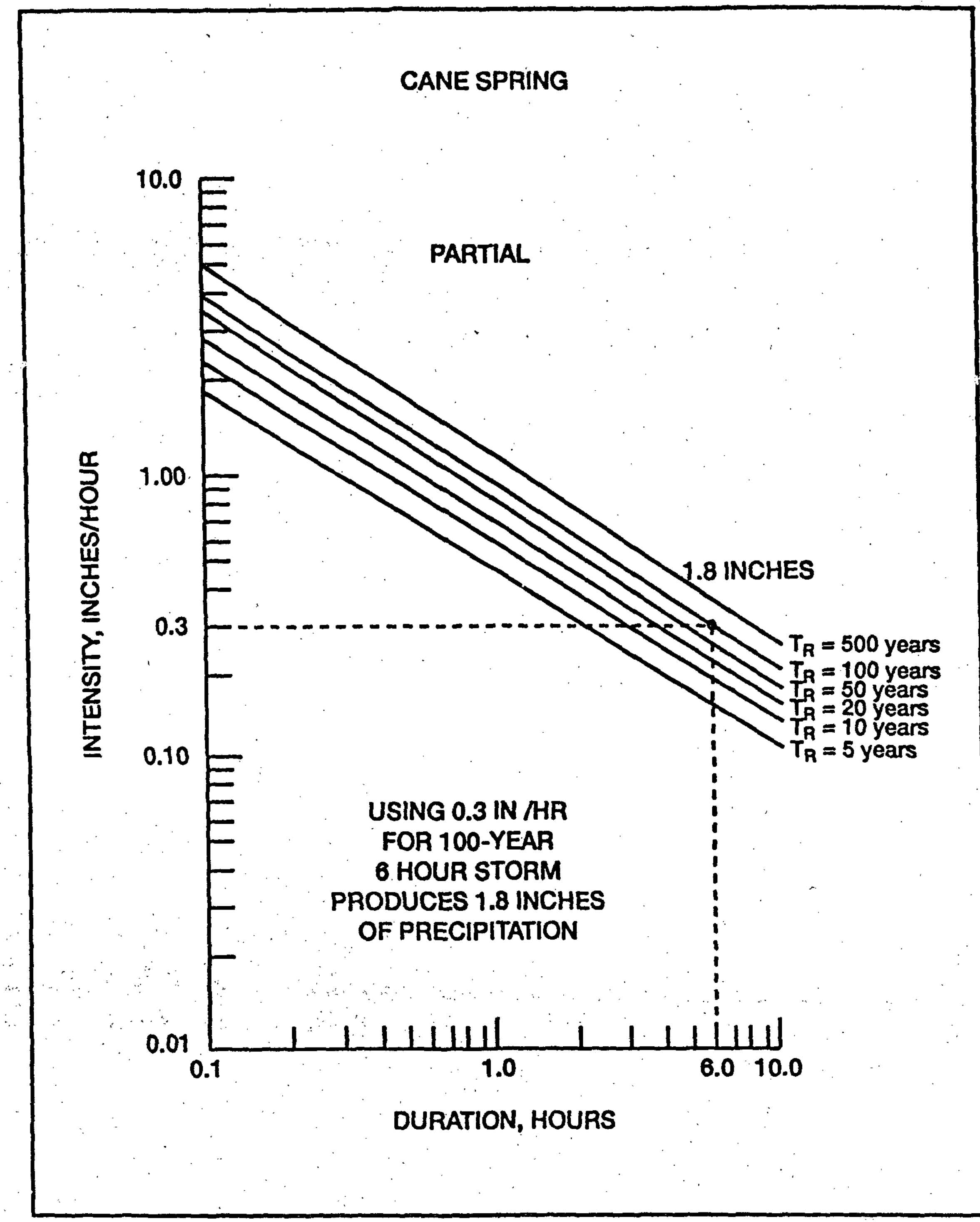


Figure 5. Intensity Duration Relationships for Various Return Periods, Cane Springs, Nevada Test Site, Nevada (modified from French, 1983). The 100-year, 6-hour point precipitation value of 1.6 inches compares well with the value from French, 1983.

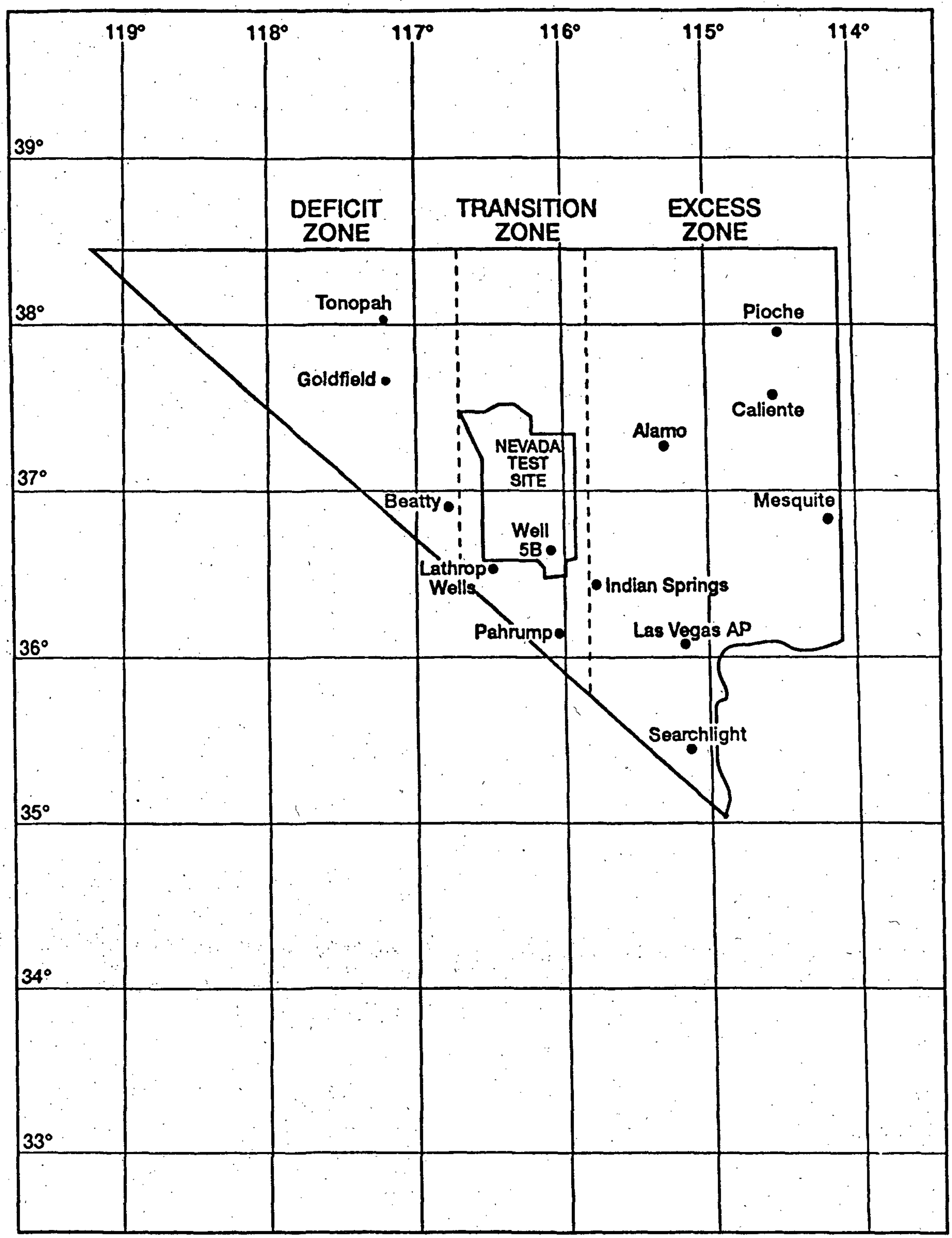
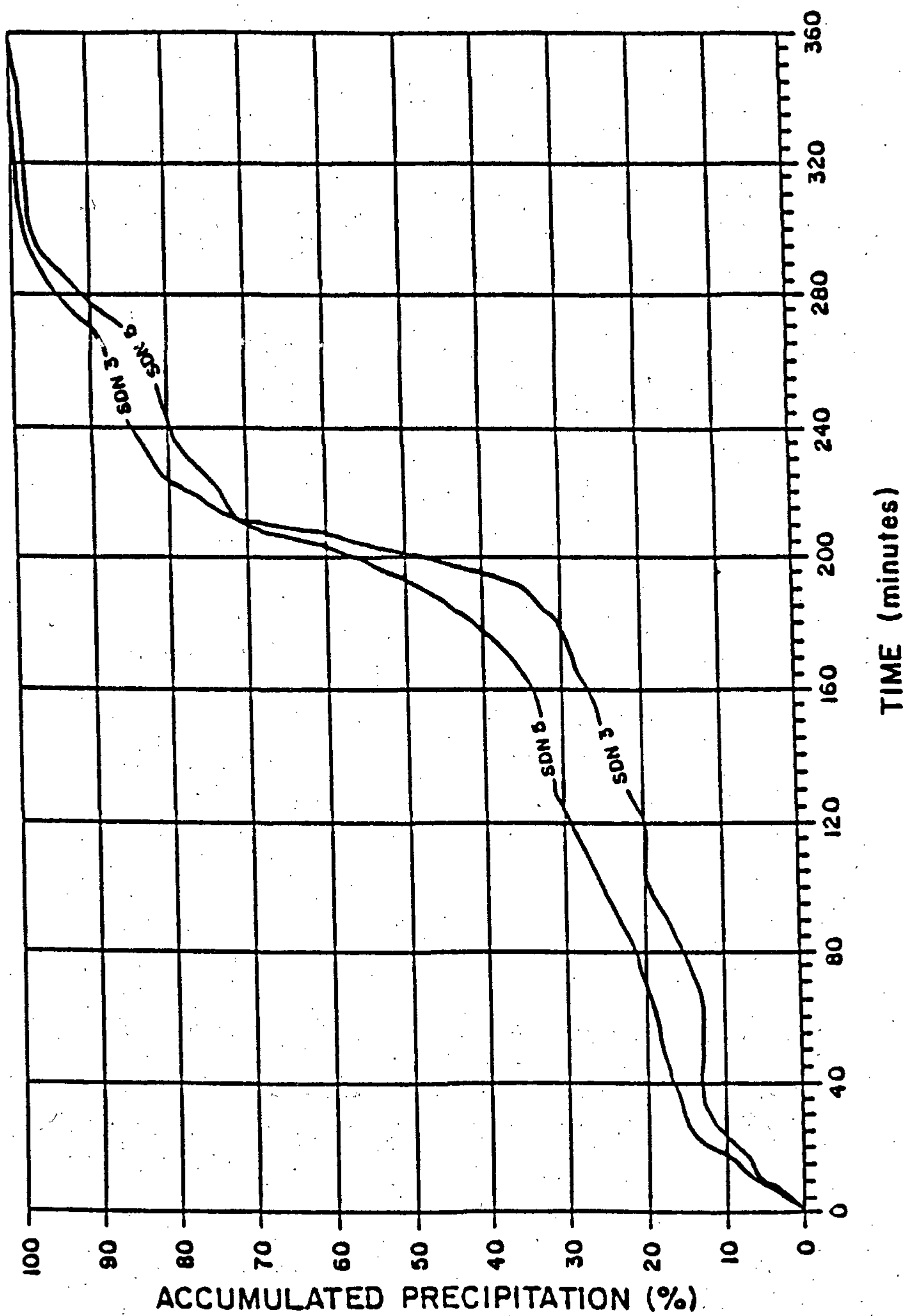


Figure 6. Hypothesized Zones of Precipitation in Southern Nevada (modified from French, 1983). The NTS is located in the transition zone of precipitation.

SIX-HOUR DESIGN STORM DISTRIBUTIONS



Notes:

1. For drainage areas less than 10 square miles in size, use SDN 3.
2. For drainage areas equal to or greater than 10 square miles in size, use SDN 5.

Figure 7. Storm Distributions (CCRFCD Manual, 1990). Storm distribution curves are selected based on drainage basin size.

c. Depth-Area Ratios

During a flood-producing storm, usually a convectional storm in this region, point precipitation values probably would not apply to an entire drainage basin. Depth-area ratios have been developed for arid regions which reduce the point precipitation value for a watershed as a function of area. Clark County uses the depth-area ratios that were developed by the COE for Clark County and vicinity (Table 2). These depth-area ratios are a modification of ratios developed by Zehr (1984) on arid watersheds in Arizona and New Mexico. Ratios in the CCRFCD Manual were used in the hydrologic model for the RWMS.

3.1.2 *Drainage Areas*

The area of each drainage basin defined in the hydrologic model was delineated using 7.5- and 15-minute United States Geological Survey (USGS) topographic quadrangle maps of the area (*Figures 2* and *3*; *Sheets 1* and *2*), along with 1:6,000 orthophotos with a 10-foot contour interval that were developed for the area. Basin delineations were verified by field observations and study of color and infrared aerial photos. The area of each subbasin was determined using a planimeter. The drainage area, and the other watershed parameters for each subbasin used in the HEC-1 model, are listed in Table 3. The USGS topographic maps used to define the drainage area are:

15-minute Topographic Quadrangles (USGS):

- Papoose Lake (1952)
- Frenchman Lake (1952)
- Cane Spring (1952)
- Topopah Spring (1952)
- Tippipah Spring (1952)

7.5-minute Topographic Quadrangles (USGS):

- Plutonium Valley (1986)
- Frenchman Lake (1986)
- Yucca Lake (1986)
- Cane Spring (1986)

3.1.3 *Precipitation Losses*

Precipitation losses were determined using the SCS curve number methodology and the applicable table (Table 4) found in the CCRFCD Manual. The following information is required to determine a curve number for a specific subbasin:

- hydrologic soil group;
- vegetation type; and
- percent ground and vegetation cover.

The following procedures were used to obtain this information:

1. The percent of bedrock and alluvium was determined for each subbasin using aerial photos and geologic and topographic maps. Bedrock areas of the subbasins were assigned as hydrologic soil group D. This soil group has high runoff potential and applies to

Table 2. **Six-Hour Precipitation Depth-Area Reduction Factors (CCRFCD Manual, 1990).** Depth-area ratios reduce the point precipitation value for a watershed as a function of area.

Drainage Area (mi^2)	Reduction Factor	100-Year (in.)	10-Year (in.)	2-Year (in.)
0.01	1.00	1.60	1.11	0.70
1	0.97	1.55	1.07	0.68
10	0.86	1.38	0.95	0.60
20	0.79	1.26	0.87	0.55
50	0.68	1.09	0.75	0.48
100	0.60	0.96	0.66	0.42

Table 3. **Watershed Parameters.** Watershed parameters were delineated using topographic maps, aerial photos, and field investigations.

Watershed Name	Basin Area (mi^2)	Curve Numbers AMC I	AMC II	AMC III	Lag Time (hrs)
MM1A	0.9	63	80	90	0.31
BW1	60.5	67	83	93	2.10
BW2	20.8	63	80	90	0.90
MM1B	2.1	59	77	87	0.48
MM2	1.4	62	79	89	0.47
HP1A	0.8	70	85	95	0.30
HP1B	1.0	60	78	88	0.51
HP2	1.2	60	78	88	0.51
HP3	1.7	66	82	92	0.59
HP4	3.3	62	79	89	0.52
HP5	1.2	62	79	89	0.30
HP6	2.2	63	80	90	0.55
HPFA	0.3	59	77	87	0.33
HPFB	1.6	59	77	87	0.44
SC1	39.4	66	82	92	2.10
SC2	1.5	59	77	87	0.48

Table 4. Runoff Curve Numbers (Semiarid Rangelands[1]) [CCRFCD Drainage Manual, 1990 {reference SCS TR-55, USDA, June 1986}]. Hydrologic soil group, vegetation type, and percent of ground cover determine curve numbers.

Cover Description		Curve Numbers for Hydrologic Soil Group			
Cover Type	**Hydrologic Condition[2]**	**A[3]**	**B**	**C**	**D**
Herbaceous—mixture of grass, weeds, and low-growing brush, with brush the minor element	Poor	--	80	87	93
	Fair	--	71	81	89
	Good	--	62	74	85
Oak-aspen—mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush	Poor	--	66	74	79
	Fair	--	48	57	63
	Good	--	30	41	48
Pinyon-juniper—pinyon, juniper, or both; grass understory	Poor	--	75	85	89
	Fair	--	58	73	80
	Good	--	41	61	71
Sagebrush with grass understory	Poor	--	67	80	85
	Fair	--	51	63	70
	Good	--	35	47	55
Desert shrub—major plants include saltbush, greasewood, creosote bush, blackbrush, bursage, palo verde, mesquite, and cactus	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

[1] Assume Antecedent Moisture Condition II.

[2] *Poor:* < 30% ground cover (litter, grass, and brush overstory).
Fair: 30 to 70% ground cover.
Good: > 70% ground cover.

[3] Curve numbers for Group A have been developed only for desert shrub.

areas with shallow soils or exposed bedrock. The alluvium is mostly sand and was assigned as hydrologic soil group B based on the preliminary surficial map by Rawlinson (1991), Romney (1973), and extensive field investigation conducted by the authors.

2. The cover type for the subbasins was determined to be desert shrub based on descriptions given in *Table 4*, field investigation, and study of aerial color and infrared photos.

3. The hydrologic condition was determined to be poor based on 30 ground surveys conducted on the alluvium. Ground cover ranged between 5 and 30 percent (*Table 4*). Results of these surveys were assumed to be representative of all subbasins. This assumption

was verified by study of aerial photos and field investigations. Because of the very steep slopes and minimal or nonexistent soil, bedrock areas have less vegetation than alluvial areas; therefore, the hydrologic condition of the bedrock areas was also classified as poor.

According to the CCRFCD Manual, curve numbers for precipitation losses should be determined assuming an antecedent moisture condition of II (AMC–II). Antecedent moisture condition is dependent on the antecedent rainfall. The antecedent rainfall is the amount of rainfall between 5 and 30 days preceding a flood–producing storm. AMC–I assumes the soil is dry, and AMC–III assumes the soil is near or at saturation; AMC–II is halfway between AMC–I and AMC–III. The CCRFCD Manual designates AMC–II because data required to determine the antecedent moisture condition for an entire area are not quantifiable.

Assuming AMC–II, curve numbers for the alluvium and bedrock were 77 and 88, respectively. The curve number for each subbasin was determined by taking the weighted average between the percentage of alluvium and bedrock present in each subbasin. Curve numbers for each subbasin for AMC–I, AMC–II, and AMC–III are listed in *Table 3*. Hydrologic models in this study developed to estimate the 2–year and 10–year discharges assumed the antecedent moisture conditions were AMC–II. The 100–year hydrologic models developed for this study assumed conditions ranging between AMC–II and AMC–III. The results from all the models and the justification for varying the curve numbers per antecedent moisture conditions are addressed in Section 3.4, *Hydrology Discussion*.

3.1.4 *Lag Time*

In the SCS unit hydrograph method, only one input parameter, the lag time, is required. The CCRFCD Manual uses the lag time equation from the U.S. Bureau of Reclamation (Cudworth, 1989) for subbasins greater than 1-square mile:

$$TLag - 20K_n(\frac{LL_c}{S^{1/2}})^{1/3}$$

where:

TLag = the lag time (hours) between the center of mass of rainfall excess and the peak of the unit hydrograph.

K_n = the Manning roughness factor (dimensionless) for the basin channels.

L = the length of the longest watercourse (miles) within the subbasin.

L_c = the length along the longest watercourse (miles) measured upstream to a point opposite the centroid of the basin.

S = the average slope of the longest watercourse (feet per mile).

As indicated in the CCRFCD Manual, K_n is subjective. Therefore, criteria listed in Table 604 in the CCRFCD Manual (Table 5) are recommended and were used for this study. Characteristics of the subbasins fell halfway between the "n" value description for 0.03 and 0.05. Parameters used to determine the lag time are listed in Table 6. The L and S values for each

subbasin were determined using a map wheel on the watershed maps (*Sheets 1* and *2*). The L_c value was determined using a planimeter to find the centroid of each subbasin. A point on the longest watercourse of each subbasin which was closest to the respective centroid was selected.

3.1.5 *Channel Routing*

The Muskingum routing method was used for routing reaches. This routing method requires three parameters: x, K, and the integer step. The weighting factor (x) expresses the amount of attenuation of the flood wave within the reach (Dunne and Leopold, 1978), and was determined using criteria cited by the Cudworth (1989). The Muskingum coefficient (K) accounts for the translation of the peak flow for the entire channel reach. This coefficient K is directly related to the length and the average velocity of the reach. The average channel velocity is determined using the Manning Equation. The Manning roughness coefficient was chosen based on field observations. Channel geometry was determined through field measurements. (The integer step and routing reach were determined so that the total travel time through the reach would be equal to K.) Only three reaches were routed in the models. Table 7 lists the routing parameters for these reaches.

Transmission losses for the routing reaches are ignored in the models. Variability of infiltration rates along a channel reach can be extensive; thus, these losses over an entire reach are difficult to quantify. Ignoring these losses adds another conservative assumption into the model.

3.2 Hydrologic Models

Seven hydrologic models were developed using the HEC-1 computer program to determine discharges for this flood assessment (Table 8). All the models have the same hydrologic parameters, with the exception of point precipitation values and curve numbers. The differences between the models are explained in each model description (*Table 8*). Output from the seven hydrologic models are located in Appendix A.

3.2.1 *Model Layout*

The overall watershed that could impact the RWMS was divided into 16

Table 7. **Routing Parameters.** The Muskingum routing method was used for routing reaches.

Reach name	Integer Step	Storage Constant (K)	Weighting Factor (X)
HP1A to CPA	9	0.43	0.2
HP6 to CPD	5	0.27	0.2
CPD to CPE	8	0.39	0.2

NOTE:

Integer Step: The integer step is the number of subreaches for the Muskingum routing in the HEC-1 models.

Storage Constant (K): The Muskingum "K" coefficient is the travel time (hours) through the reach.

Weighting Factor (X): The weighting factor expresses the amount of attentuation of the flood wave within the reach.

Table 8. Hydrologic Models. Hydrologic models were developed for the 2-year, 10-year, and 100-year flood events.

100-Year Hydrologic Model	
RWMS.OUT	Point precipitation values were taken from NOAA Atlas 2, Volume VII. Curve numbers were developed assuming AMC-II.
RWMSCN.OUT	Point precipitation values were taken from NOAA Atlas 2, Volume VII. Curve numbers for all basins were increased by 5 to account for an AMC greater than II.
[illegible]	[illegible]

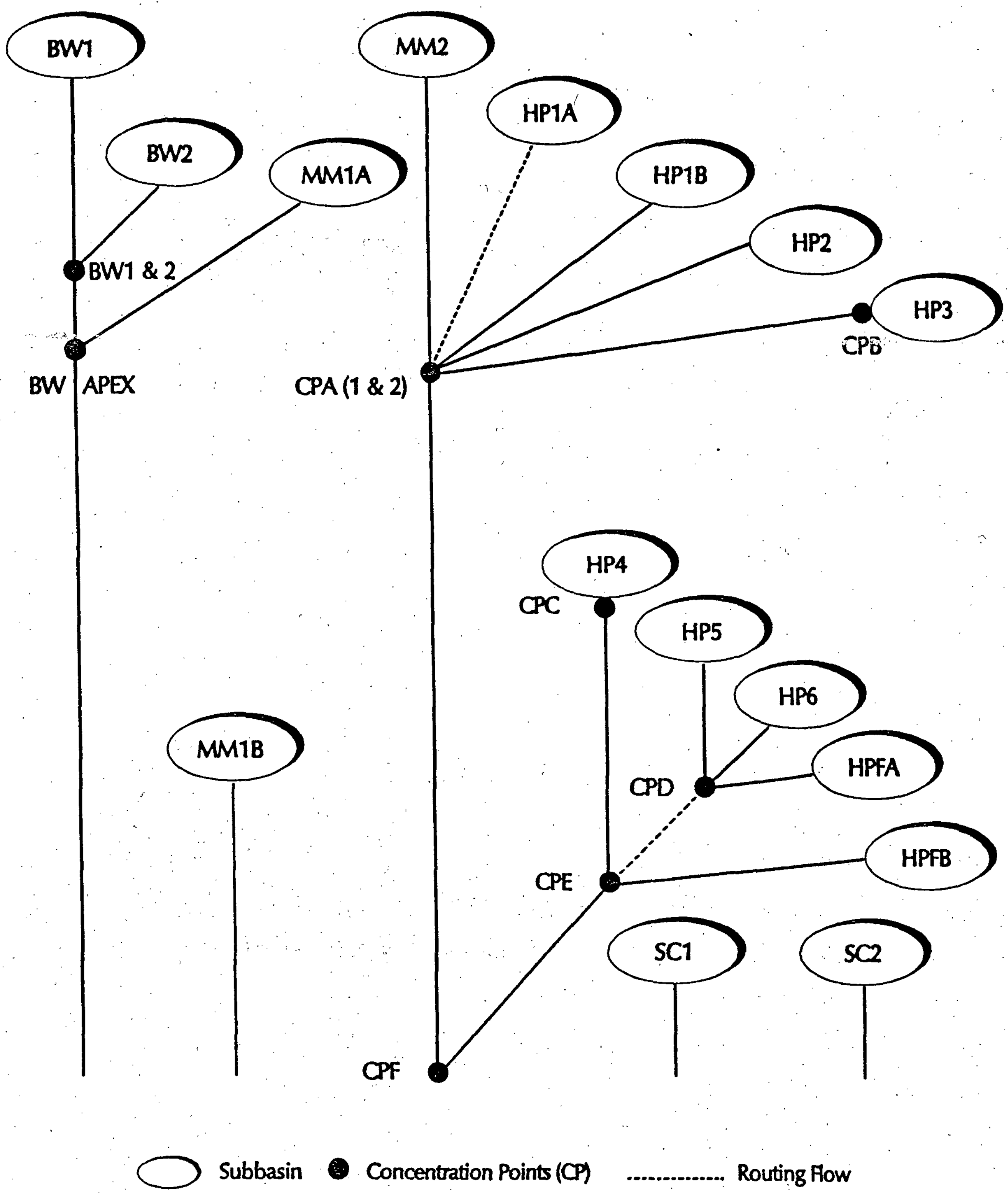


Figure 8. Schematic Diagram of Stream Network. This diagram shows how the 16 subbasins were combined in the HEC-1 models.

Another conservative assumption pertaining to subbasin HPFB was made in the model layout for a part of this subbasin that drains directly towards CPE. Difficulty in determining the percentage of discharge that could reach the RWMS from this subbasin led to the assumption that the entire subbasin would drain towards the RWMS.

Figure 8 shows flow from BW Apex, MM1B, SC1, and SC2 not connected to the major concentration points. Flow from BW Apex was not connected because flow from this drainage does not currently impact the RWMS; however, channel avulsions can potentially occur during a flood, thus directing flow towards the RWMS. This potential is addressed in Section 4.2, *Results and Discussion of Flood Hazard Determination*. Subbasin MM1B encompasses the Barren Wash Alluvial Fan, and flow that falls directly onto the fan would not drain towards the RWMS.

Subbasin SC1 is the Scarp Canyon watershed. The concentration point for this watershed is the apex of the Scarp Canyon Alluvial Fan. Flow from this watershed does not impact the RWMS, as shown in the Section 4.2, *Results and Discussion of Flood Hazard Determination*. Subbasin SC2 is a portion of the nonactive fan surface composed of sediments deposited by the Scarp Canyon channel. Because the channel has become entrenched and has extended the active apex approximately 2.5-miles down the existing fan surface, runoff from this surface would be sheetflow and, as indicated by the topography (*Figure 3* and *Sheet 2*), drains away from the RWMS.

3.2.2 *Concentration Points*

The concentration point locations were determined to provide discharges at the most appropriate location for the hydraulic analysis (*Figures 2* and *3* and *Sheets 1* and *2*). Concentration points were selected for sheetflow locations and at the active apexes of the alluvial fans. In the case of sheetflow, with the exception of CPC and CPD, the concentration points were spread across the area of potential flood impact with the RWMS. CPC was selected where all water from subbasin HP4 would be funneled southwest between subbasins HP4 and HPFB towards the RWMS. CPD was selected where water from subbasins HP5, HP6, and HPFA would be concentrated together before being routed to CPE.

3.3 Hydrology Results

Discharges of key concentration points from the seven models used in this analysis are listed in Table 9.

Discharges from the models RWMS2.OUT, RWMS10.OUT, and RWMSW.OUT (2-year, 10-year, and 100-year discharges, respectively) were used in the analysis to determine the flood hazard zones for the Barren Wash, Scarp Canyon, and Halfpint alluvial fans. Discharges from RWMSW.OUT were used to evaluate the 100-year sheetflow and shallow concentrated flow that could impact the RWMS. Justification for choosing these models is discussed in the following section.

3.4 Hydrology Discussion

Although only three models were used in the flood assessment, a total of seven models were developed and evaluated in this study. A two-step approach was used to select the appropriate models for the 2-year, 10-year, and 100-year discharges. The following paragraphs provide a description of this approach.

Table 9. **Discharges From HEC-1 Models at Key Concentration Points.** The 100-year discharges from RWMSW.OUT were used in the *flood hazard* determination.

		100-Year Discharges (cfs)				**10-Year Discharges (cfs)**		**2-Year Discharges (cfs)**
Concentration Point	**DA (mi^2)**	**RWMS.OUT**	**RWMSCN.OUT**	**RWMSW.OUT**	**RWMSC.OUT**	**RWMS10.OUT**	**RWMS10C.OUT**	**RWMS2.OUT**
BWAPX*	82.20	1,848	3,513	6,018	5,498	510	1,083	22
CPA1	4.40	459	786	1,229	1,297	130	278	15
CPA2	6.10	659	1,126	1,757	1,827	187	399	23
CPB	1.70	263	420	624	661	87	170	14
CPC	3.30	360	626	984	1,060	88	210	8
CPD	3.70	333	570	884	945	90	199	10
CPE	8.60	603	1,180	1,819	1,898	168	335	9
CPF	14.70	878	1,462	2,396	2,462	301	576	25
SC1APX**	39.40	1,251	2,178	3,498	3,438	356	769	15

*Barren Wash Apex
**Scarp Canyon Apex

NOTE: Discharges were calculated using the HEC-1 computer program and do not represent significant figures.

The first step focused on the hydrologic model (HEC-1) for the 2-year flood. In arid regions, such as the RWMS location, it is common that no flow will occur in washes for several years; therefore, the 2-year model-generated discharges for the subbasins should be close to zero. The 2-year discharges from RWMS2.OUT (*Table 9*) were low, less than 25 cubic feet per second. These discharges from RWMS2.OUT appear reasonable so no other model was developed for the 2-year flood.

To verify the model-generated discharges for the 10-year and 100-year floods, another step was required. This step compared the skew coefficient developed from model-generated discharges and the regional skew coefficient (Water Resource Council [WRC] 17B, 1981). If the hydrologic models are producing reasonable discharges, then the skew coefficient from these models should be close to the regional skew coefficient.

A major assumption in using skew coefficients is that the relationship between discharge and return period must follow a Log-Pearson Type III (LPIII) probability distribution, as specified in WRC (1981). The FEMA FAN computer program (1990) contains a subroutine that calculates skew coefficients using a least-square fit and a LPIII probability distribution. This program calculated skew coefficients for specific concentration points using model-generated discharges. This program requires discharges for a minimum of three return periods to calculate the skew coefficient. (In this analysis the 2-year, 10-year, and 100-year model-generated discharges were entered into the FAN program.)

WRC (1981) contains a map which shows the regional skew coefficients for the country (Figure 9). According to the information on this map, the skew coefficient for washes on the NTS should be near zero. A zero skew coefficient means that if discharge versus probability were plotted on log-probability paper, then the flood frequency curve would plot as a log-normal distribution (a straight line). Preliminary results from a study by the USGS using stream gage data gathered after 1981 also support a zero skew for this region (Hjalmarson [personal communication], 1992).

The first three models that were evaluated using the skew comparison approach were RWMS2.OUT, RWMS10.OUT, and RWMS.OUT (Model Set 1). These models were developed using the noncorrected precipitation values from NOAA Atlas 2, Volume VII (1973) and followed the methods in CCRFCD Manual for the remaining input parameters. Discharges at the apexes of the Barren Wash, Halfpint, and Scarp Canyon alluvial fans were evaluated. Discharges at these apexes were entered into the FAN program to determine the skew coefficients. The skew coefficients, as shown in Table 10, were negative and were not close to zero. The discharges in this set must be adjusted to move the skew coefficients closer to zero. The 2-year model (RWMS.OUT2) was determined to generate reasonable results; therefore, adjustment must occur either to the 10-year, 100-year or both models.

Modification of curve numbers in the 100-year model were evaluated first. Two additional 100-year models were created from the original 100-year model (RWMS.OUT): RWMSCN.OUT and RWMSW.OUT. In RWMSCN.OUT, curve numbers were 5 greater than the original model, and in RWMSW.OUT, curve numbers were 10 greater than the original model. Increasing the curve numbers by 5 assumes a antecedent moisture condition between AMC-II and AMC-III; increasing the curve numbers by 10 assumes AMC-III.

Using these models, two additional model sets were developed with these two models: Model Set 2 (RWMS2.OUT, RWMS10.OUT, and RWMSCN.OUT) and Model Set 3 (RWMS2.OUT, RWMS10.OUT, and RWMSW.OUT). The 2-year, 10-year, and 100-year

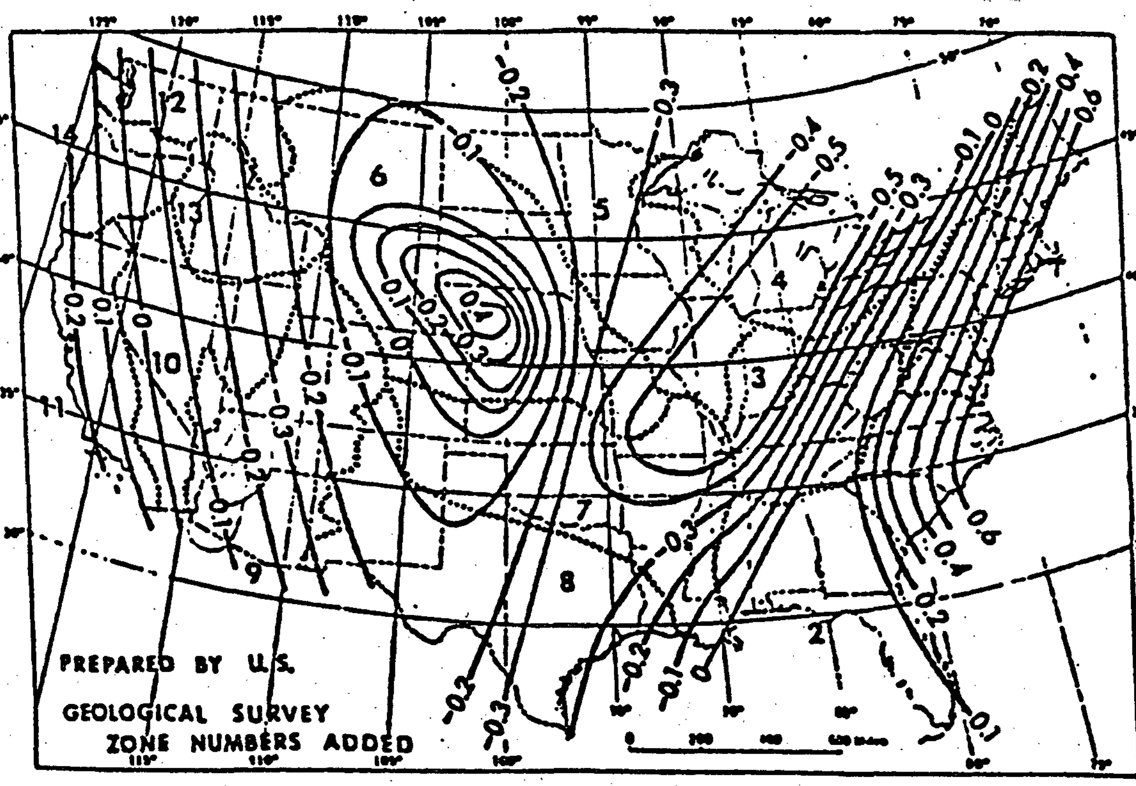


Figure 9. Generalized U.S. Skew Coefficients (WRC [1981]). The Nevada Test Site is located in an area with a zero skew coefficient value.

Table 10. Skew Coefficients From Different Model Sets. Model Set 3 generated skew coefficients closest to zero for the three apexes.

Apex Locations	Model Set 1	Model Set 2	Model Set 3	Model Set 4
Barren Wash	-1.2	-0.6	-0.1	-1.2
Scarp Canyon	-1.2	-0.7	-0.3	-1.3
Halfpint	-1.1	-0.4	0.1	-1.0

Return Period	Model Set 1	Model Set 2	Model Set 3	Model Set 4
2-Year Model	RWMS2.OUT	RWMS2.OUT	RWMS2.OUT	RWMS2.OUT
10-Year Model	RWMS10.OUT	RWMS10.OUT	RWMS10.OUT	RWMS10C.OUT
100-Year Model	RWMS.OUT	RWMSCN.OUT	RWMSW.OUT	RWMSC.OUT

The 10-year and 100-year hydrologic models could be modified by adjusting the curve numbers, depth of precipitation, or lag times. Of these three parameters, curve numbers have the widest variability because they are dependent on antecedent moisture conditions, as indicated in *Table 3*. Curve numbers for the subbasin in this study (*Table 3*) can range in the 50's and 60's under dry soil conditions (AMC-I) to the high 80's and low 90's (AMC-III) for saturated conditions. The CCRFCD Manual assumes AMC-II because antecedent moisture conditions for a drainage basin are impossible to quantify and a standard approach is required in Clark County to assure consistent analysis and design in drainage facilities and structures. The assumption of AMC-II may be reasonable for the 2-year flood event, as reflected in RWMS2.OUT, but may not be for the 10-year and 100-year flood events. For 10-year floods or greater, the antecedent moisture condition as well as rainfall may contribute to flooding.

Precipitation depth and lag times are not as variable. Variation from the precipitation depths in NOAA Atlas 2, Volume VII is not supportable because analysis of precipitation data in the study area (French, 1983; and Barker [personal communication], 1992) do not vary substantially from the values in NOAA Atlas 2, Volume VII, and any variation to precipitation data would be difficult to support. Variability in lag time is limited because three of the four parameters (L, L_c, and S) are measured from a topographic map, and significant variations in the K_n are not defensible using the methods described in the CCRFCD Manual (*Table 5*). Therefore, the curve numbers in the models were considered the most reasonable parameter to modify.

Modification of curve numbers in the 100-year model were evaluated first. Two additional 100-year models were created from the original 100-year model (RWMS.OUT): RWMSCN.OUT and RWMSW.OUT. In RWMSCN. OUT, curve numbers were 5 greater than the original model, and in RWMSW.OUT, curve numbers were 10 greater than the original model. Increasing the curve numbers by 5 assumes an antecedent moisture condition between AMC-II and AMC-III; increasing the curve numbers by 10 assumes AMC-III.

Using these models, two additional model sets were developed with these two models: Model Set 2 (RWMS2.OUT, RWMS10.OUT, and RWMSCN.OUT) and Model Set 3 (RWMS2.OUT, RWMS10.OUT, and RWMSW.OUT). The 2-year, 10-year, and 100-year discharges for each model set were entered into the FAN program. The skew coefficients of the apexes of the three fans were closer to zero (*Table 10*). Model Set 3 generated skew coefficients closest to zero for the three apexes. These models from Model Set 3 were used to define the 100-year flood hazards in this flood assessment.

The 10-year model was not modified because an increase in the curve numbers would require a corresponding increase in the curve numbers for the 100-year model to maintain a zero skew. Assuming AMC-III (saturated conditions), the discharges generated from RWMSW.OUT are at their upper limit; therefore, an increase in curve numbers for the 10-year

4.1 Hydraulics and Flood Hazard Determination Methodology

4.1.1 FEMA Alluvial Fan Methodology

Flooding from the Barren Wash, Scarp Canyon, and Halfpint alluvial fans could impact these facilities. Hydraulic processes on alluvial fans are different than in riverine channels. Alluvial fan flooding, as described by FEMA (1991), ". . . is characterized by high-velocity flows; active processes of erosion, sediment transport, and deposition; and unpredictable flowpaths." Channel geometry and direction on alluvial fans can change in direct response to a flood discharge. Field investigations and study of topographic maps and aerial photos of the Barren Wash, Scarp Canyon, and Halfpint alluvial fans support this description because flowpaths are unpredictable, soil development is weak, and evidence of recent erosion and deposition is present.

FEMA (1991) states that if flowpaths below the active apex cannot be predicted (which is the case for the Barren Wash, Scarp Canyon, and Halfpint alluvial fans), the FEMA Alluvial Fan Methodology must be applied to evaluate the 100-year flood hazard. This methodology, which is a modification of the method proposed by Dawdy (1979), relates probability of discharges at the apex to probability of channel depths and flow velocities that occur on the alluvial fan.

According to Dawdy (1979), flood flow from the apex of a typical alluvial fan does not spread evenly over the fan surface, but is instead confined to a surface or channel that carries the flood waters from the apex to the toe of the fan (Figure 10). The active apex is selected at the point where the flowpath becomes unpredictable, and flow is no more likely to follow an existing channel than create a new path. In the upper region of an alluvial fan, flow is confined to a single channel where the depth and width of the channel is a function of the flow itself. In general, flow occurs at critical depth and velocity as a result of steep slopes associated with this upper region. As slopes decrease towards the mid and distal parts of the fans, channel bifurcation can occur resulting in a multiple-channel region. Dawdy (1979) did not incorporate a multiple-channel region into his methodology. FEMA (1991) modified the Dawdy methodology to address multiple-channel regions of alluvial fans.

Key assumptions of the FEMA Alluvial Fan Methodology follow (French, 1989):

1. The location of the flood event channel on the fan surface is random. Furthermore, the probability of the channel passing through any given point on a contour is uniform.

2. Flow occurs in flow-formed channels. Well-defined channels result from the subsequent erosion from this process.

   a. Incised channels do not exist previous to the first flow event.

   b. Existing channel capacity is not adequate to convey the flow, and overbank flooding occurs.

3. The width and depth of the channel is a function of discharge.

4. Transmission losses are not considered.

5. On-fan precipitation is not considered.

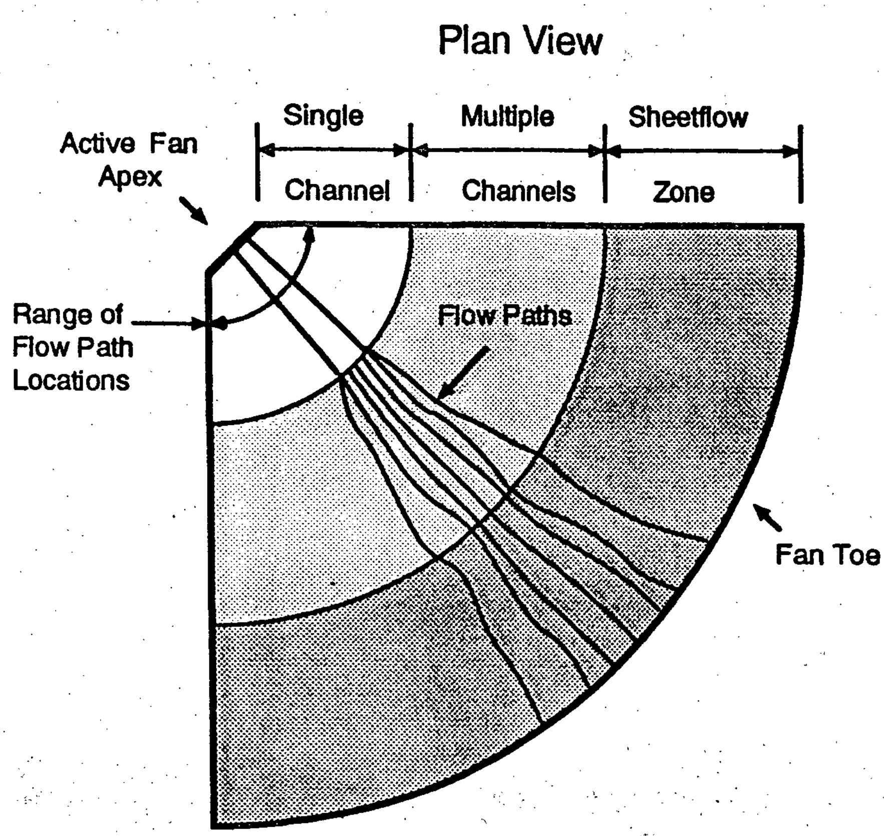


Figure 10. Alluvial Fan Plan View (modified from French, 1989). Plan view of an idealized alluvial fan showing the single channel, multiple channel, and sheetflow regions.

6. The alluvial fan is active; e.g., net deposition is occurring in both time and space and avulsions (the migration of channel from one location to another during a single event) are occurring.

7. Flood discharge frequency distribution must be available at the apex of the alluvial fan.

Field observations, a study of topographic and geologic maps, aerial photographs, and examination of historic records were made during the flood assessment of these alluvial fans. Sources of flooding were defined, an apex selected, active fan boundaries delineated, entrenched reaches of channels located and measured, and locations of barriers to flow determined.

The methodology used for defining flood hazards on alluvial fans incorporates FEMA's computer model, FAN (1990). Delineation of the 100–year flood hazard using the FEMA FAN Model requires the following parameters and assumptions:

- Discharge information
- Apex location
- Fan boundaries and dimensions
- Potential flow obstructions and/or diversions
- Multiple channel region parameters:
  - Manning roughness coefficient
  - Slope

The FAN model requires that at least three discharges of different return periods be used to define the flood hazard zones. The 2–year, 10–year, and 100–year flood discharges for the Barren Wash, Scarp Canyon, and Halfpint alluvial fans were taken from the HEC–1 models labeled RWMS2.OUT, RWMS10.OUT, and RWMSW.OUT, respectively (*Table 9*). Discharges calculated by the HEC–1 models for CPBWAPEX or CPBW1&BW2 (*Figure 8*), whichever were greater, were used as the discharges at the apex of the Barren Wash Alluvial Fan in the FAN model. Discharges used in the FAN model for Scarp Canyon were taken from the HEC–1 models at the active apex of Scarp Canyon (Subbasin SC2). Discharges for Halfpint Alluvial Fan were taken from CPE as calculated within the HEC–1 model, and were assumed to have originated from the fan apex. All approaches for selecting discharges at the apexes are considered to be conservative.

Apex locations and fan boundaries were determined from aerial photographs; available topographic, geologic, and surficial maps; and field investigations. Apexes were located using the FEMA definition for an active apex. Location of the apexes for Barren Wash, Scarp Canyon, and Halfpint alluvial fans are shown in Figure 11 and Sheet 3.

Potential flow obstructions and diversions such as roads, buildings and other structures which can prevent flooding in some areas and increase flooding in others must be designated. In this flood assessment, all barriers such as Mercury Highway, 5–01 road, all secondary roads, the nonengineered berms surrounding the RWMS perimeter, and all disturbed areas diverting flow away from the RWMS were ignored. Quantification of the diversion would be difficult. Assuming that all flow can reach the RWMS produces a more conservative flood analysis.

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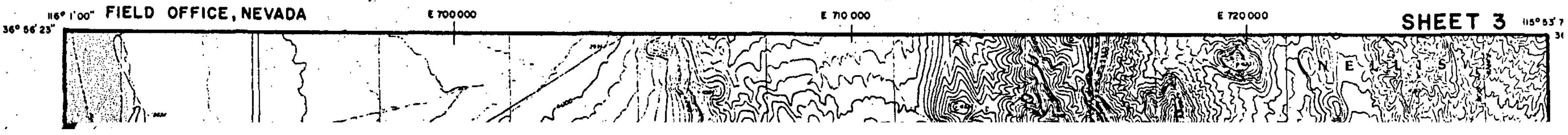
FIELD OFFICE, NEVADA

SHEET 3



APPENDIX B

FEMA FAN MODEL OUTPUT

APPENDIX C

HEC-2 MODEL OUTPUT

APPENDIX D

SHEETFLOW CALCULATIONS

4.2 Results and Discussion of Flood Hazard Determination

Using the methods described in the previous section, the 100-year flood hazard areas were defined on the topographic maps (*Figure 11* and *Sheet 3*). Zone AO and Zone X were used to denote the flood hazards in the vicinity of the RWMS.

FEMA designates alluvial fan, shallow concentrated flow, and sheetflow areas with a 100-year flood depth of greater than 1 foot as a Zone AO. FEMA (1990) defines Zone AO as the area of 100-year shallow flooding where average depths are between 1 and 3 feet. For alluvial fans, anywhere throughout the zone there is a probability of 0.01 that a channel can occur at the designated depth with flow at the designated velocity. Zone X, shown on *Figure 11* and *Sheet 3* and Figure 12 and Sheet 4, represents areas outside the 100-year flood hazard and/or areas of the 100-year shallow flooding (sheetflow or shallow concentrated flow) where average depths are less than 1 foot. A Zone X delineation does not mean that floods will not occur within this zone. For this reason, flood hazard protection must be addressed.

4.2.1 Alluvial Fan Flooding

The 100-year flood hazard zones for the Barren Wash, Scarp Canyon, and the Halfpint fans are shown on *Figure 11* and *Sheet 3*. The 100-year flood hazard for the RWMS and its immediate vicinity is also shown on an 1:6,000 orthophoto (*Figure 12* and *Sheet 4*).

Using the FEMA Fan Methodology, the southwest corner of the RWMS is within the 100-year flood hazard zone, designated as Zone AO; depth 1 foot; velocity 3 feet per second, of the Barren Wash Alluvial Fan. The part of the RWMS that is located within Zone AO of this

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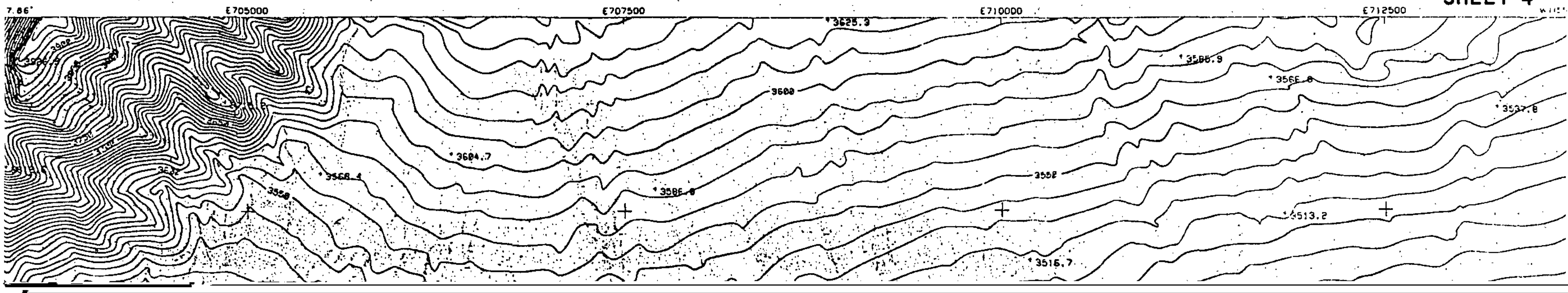
SHEET 4



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APPENDIX A

HEC-1 MODEL OUTPUT

APPENDIX A

APPENDIX A

HEC-1 MODEL OUTPUT

100-YEAR MODELS			
RWMS.OUT	RWMSCN.OUT	RWMSW.OUT	RWMSC.OUT

10-YEAR MODELS	
RWMS10.OUT	RWMS10C.OUT

2-YEAR MODEL
RWMS2.OUT

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*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *   U.S. ARMY CORPS OF ENGINEERS      *
*             SEPTEMBER 1990            *                    *   HYDROLOGIC ENGINEERING CENTER     *
*              VERSION 4.0              *                    *         609 SECOND STREET           *
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

ID   FLOOD ASSESSMENT FOR RWMS JOB #:51056        FILE: RWMS.DAT
ID   100-YEAR 6-HOUR STORM 1.6 INCHES
ID   POINT RAINFALL VALUES FORM NOAA ATLAS 2 VOL VII
ID   DEPTH-AREA REDUCTION FACTORS FROM TABLE 502 IN
ID   CLARK COUNTY HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL (CCRFCD, 1990)
ID   CURVE NUMBERS DETERMINED USING TABLE 602 IN CCRFCD, 1990
ID   LAG TIMES DETERMINED USING METHOD IN SECTION 606.3 IN CCRFCD, 1990
ID   DRAINAGE AREAS FROM 7.5 MINUTE AND 15 MINUTE QUADS
ID   THIS MODEL ADDRESSES DRAINAGES THAT COULD IMPACT THE RWMS
*DIAGRAM
IT       3       0       0     300
IO       5
IN       5
JD     1.6     .01
* RAINFALL DISTRIBUTION FROM CLARK COUNTY MANUAL LESS THAN 10 SQ. MILES
PC       0       2     5.7     7.0     8.7    10.8    12.4    13.0    13.0    13.0
PC    13.0    13.0    13.0    13.3    14.0    14.2    14.8    15.8    17.2    18.1
PC    19.0    19.7    19.9    20.0    20.1    20.4    21.4    22.9    24.1    24.9
PC    25.1    25.6    27.0    27.8    28.1    28.3    29.5    32.2    35.2    40.9
PC    49.9    59.0    71.0    74.4    78.1    81.2    81.9    83.5    85.1    85.6
PC    86.0    86.8    87.6    88.8    91.0    92.6    93.7    95.0    97.0    97.6
PC    98.2    98.5    98.7    98.9    99.0    99.3    99.3    99.4    99.5    99.8
PC    99.8    99.9   100.0
JD    1.55       1
JD    1.38    9.99
* CHANGED RAINFALL DISTRIBUTION ABOVE 10 SQ. MILES PER CLARK COUNTY MANUAL
JD    1.38   10.01
PC       0     2.0     5.9     8.0    11.0    14.4    15.0    16.0    16.8    17.1
PC    18.0    18.2    18.7    19.0    19.7    20.2    21.0    22.0    23.0    24.1
PC    25.0    25.9    26.5    28.0    29.0    30.0    30.5    30.9    31.0    31.7
PC    32.1    32.7    33.3    34.6    36.1    38.1    40.8    43.0    47.7    51.4
PC    56.1    63.0    71.0    72.0    73.1    75.2    77.9    79.0    79.5    80.4
PC    81.0    82.0    82.6    84.0    85.9    88.9    91.0    93.8    96.6    97.0
PC    97.4    97.9    98.1    98.3    98.5    98.9    99.0    99.2    99.3    99.6
PC    99.7    99.9   100.0
JD    1.26      20
JD    1.18      30
JD    1.09      50
JD     .96     100

KK    MM1A
KM   Basin runoff calculation for Mass. Mountains 1A
BA      .9
LS              80
UD     .31

KK     BW1
KM     Basin runoff calculation for Barren Wash 1
BA    60.5
LS              83
UD     2.1
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```
KK     BW2
KM     Basin runoff calculation for Barren Wash 2
BA    20.8
LS               80
UD       .9

KK    BW1&2
KM    Combined BW1 and BW2
HC       2

KK  BW APX
KM    Combine BW1,BW2, and MM1A (assume dischcarge of Barren Wash "active apex")
HC       2

KK     MM1B
KM     Basin runoff calulation for Mass. Mountains 1B
*   Flow was not combined with BW APX because flow from this watershed
*   will not directly impact RWMS wereas a channel migration at the apex
*   could impact the RWMS
BA      2.1
LS               77
UD      .48

KK      MM2
KM     Basin runoff calculation for Mass. Mountains 2
BA      1.4
LS               79
UD      .47

KK     HP1A
KM     Basin runoff calculation for Half Pint Range 1A
BA       .8
LS               85
UD      .48

KK    RTCPA
KM    Route Flow from HP1A to CPA
RM       9      .43      .2

KK     HP1B
KM     Basin runoff calculation for Half Pint Range 1B
BA      1.0
LS               78
UD      .51

KK      HP2
KM     Basin runoff calculation for Half Pint Range 2
BA      1.2
LS               78
UD      .51

KK     CPA1
KM     Combine MM2, routed HP1A, HP1B, HP2
HC       4

KK      HP3
KM     (CPB) Basin runoff calculation for Half Pint Range 3
BA      1.7
LS               82
UD      .59

KK     CPA2
KM     Combine HP3 with flow from CPA1
HC       2

KK      HP4
KM     (CPC) Basin runoff calculation for Half Pint Range 4
BA      3.3
LS               79
UD      .52

KK      HP5
KM      Basin runoff calculation for Half Pint Range 5
BA      1.2
LS               79
UD       .3

KK      HP6
KM      Basin runoff calculation for Half Pint Range 6
BA      2.2
LS               80
UD      .55

KK    RTCPD
KM     Route HP6 to CPD
RM       5      .27      .2
```

```
115          KK    HPFA
116          KM     Basin runoff calculation for Half Pint Range FA
117          BA      .3
118          LS              77
119          UD     .33

120          KK     CPD
121          KM     Combine HP5, routed HP6, and HPFA
122          HC       3

123          KK   RTCPE
124          KM     Route flow from CPD to CPE
125          RM       8     .39      .2

126          KK    HPFB
127          KM     Basin runoff calculation for Half Pint Range FB
128          BA     1.6
129          LS              77
130          UD     .44

131          KK     CPE
132          KM    Combine HP4 (CPC) with routed flow from CPD, and HPFB
133          HC       3

134          KK     CPF
135          KM    Combine all flow at Concentration just below RWMS (Flow from CPA & CPE)
136          HC       2

137          KK     SC1
138          KM     Basin runoff calculation for Scarp Canyon 1
             * Concentration Pt of this watershed is the active apex of the Scarp Canyon Fan
139          BA    39.4
140          LS              82
141          UD     2.1

142          KK     SC2
143          KM     Basin runoff calculation for Scarp Canyon 2
144          BA     1.5
145          LS              77
146          UD     .48
147          ZZ
```

```
                         SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE    (V) ROUTING            (--->) DIVERSION OR PUMP FLOW

   NO.    (.) CONNECTOR          (<---) RETURN OF DIVERTED OR PUMPED FLOW

   37      MM1A
              .
              .
   42         .         BW1
              .           .
              .           .
   47         .           .         BW2
              .           .           .
              .           .           .
   52         .       BW1&2............
              .           .
              .           .
   55    BW APX............
              .
              .
   58         .        MM1B
              .           .
              .           .
   63         .           .         MM2
              .           .           .
              .           .           .
   68         .           .           .        HP1A
              .           .           .           V
              .           .           .           V
   73         .           .           .       RTCPA
              .           .           .           .
              .           .           .           .
   76         .           .           .           .        HP1B
              .           .           .           .           .
              .           .           .           .           .
   81         .           .           .           .           .         HP2
              .           .           .           .           .           .
              .           .           .           .           .           .
   86         .           .        CPA1....................................
              .           .           .
              .           .           .
   89         .           .           .         HP3
              .           .           .           .
              .           .           .           .
   94         .           .        CPA2............
              .           .           .
              .           .           .
   97         .           .           .         HP4
              .           .           .           .
              .           .           .           .
  102         .           .           .           .         HP5
              .           .           .           .           .
              .           .           .           .           .
  107         .           .           .           .           .         HP6
              .           .           .           .           .           V
              .           .           .           .           .           V
  112         .           .           .           .           .       RTCPD
              .           .           .           .           .           .
              .           .           .           .           .           .
  115         .           .           .           .           .           .        HPFA
              .           .           .           .           .           .           .
              .           .           .           .           .           .           .
  120         .           .           .           .         CPD........................
              .           .           .           .           V
              .           .           .           .           V
  123         .           .           .           .       RTCPE
              .           .           .           .           .
              .           .           .           .           .
  126         .           .           .           .           .        HPFB
              .           .           .           .           .           .
              .           .           .           .           .           .
  131         .           .           .         CPE........................
              .           .           .           .
              .           .           .           .
  134         .           .         CPF............
              .           .           .
              .           .           .
  137         .           .           .         SC1
              .           .           .           .
              .           .           .           .
  142         .           .           .           .         SC2
(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
```

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*            SEPTEMBER 1990             *
*             VERSION 4.0               *
*                                       *
*  RUN DATE  01/29/1993  TIME  21:56:35 *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*     U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

```
                    FLOOD ASSESSMENT FOR RWMS JOB #:51056        FILE: RWMS.DAT
                    100-YEAR 6-HOUR STORM 1.6 INCHES
                    POINT RAINFALL VALUES FORM NOAA ATLAS 2 VOL VII
                    DEPTH-AREA REDUCTION FACTORS FROM TABLE 502 IN
                    CLARK COUNTY HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL (CCRFCD, 1990)
                    CURVE NUMBERS DETERMINED USING TABLE 602 IN CCRFCD, 1990
                    LAG TIMES DETERMINED USING METHOD IN SECTION 606.3 IN CCRFCD, 1990
                    DRAINAGE AREAS FROM 7.5 MINUTE AND 15 MINUTE QUADS
                    THIS MODEL ADDRESSES DRAINAGES THAT COULD IMPACT THE RWMS

 11 IO        OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE

   IT         HYDROGRAPH TIME DATA
                     NMIN          3  MINUTES IN COMPUTATION INTERVAL
                    IDATE     1    0  STARTING DATE
                    ITIME       0000  STARTING TIME
                       NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE     1    0  ENDING DATE
                   NDTIME       1457  ENDING TIME
                    ICENT         19  CENTURY MARK

               COMPUTATION INTERVAL     .05 HOURS
                    TOTAL TIME BASE   14.95 HOURS

          ENGLISH UNITS
               DRAINAGE AREA          SQUARE MILES
               PRECIPITATION DEPTH    INCHES
               LENGTH, ELEVATION      FEET
               FLOW                   CUBIC FEET PER SECOND
               STORAGE VOLUME         ACRE-FEET
               SURFACE AREA           ACRES
               TEMPERATURE            DEGREES FAHRENHEIT

 13 JD         INDEX STORM NO. 1
                    STRM        1.60  PRECIPITATION DEPTH
                    TRDA         .01  TRANSPOSITION DRAINAGE AREA

 14 PI          PRECIPITATION PATTERN
                   1.20      1.54      2.22      1.26       .78      1.02      1.10      1.26      1.06       .96
                    .36       .24       .00       .00       .00       .00       .00       .00       .00       .00
                    .18       .26       .42       .22       .12       .36       .44       .60       .76       .84
                    .54       .54       .54       .46       .42       .12       .10       .06       .06       .06
                    .18       .32       .60       .80       .90       .72       .64       .48       .24       .12
                    .30       .48       .84       .60       .48       .18       .16       .12       .52       .72
                   1.62      1.68      1.80      2.88      3.42      5.40      5.42      5.46      6.62      7.20
                   2.04      2.10      2.22      1.98      1.86       .42       .60       .96       .96       .96
                    .30       .28       .24       .40       .48       .48       .56       .72      1.12      1.32
                    .96       .86       .66       .74       .78      1.20       .92       .36       .36       .36
                    .18       .16       .12       .12       .12       .06       .10       .18       .06       .00
                    .06       .06       .06       .14       .18       .00       .02       .06       .06       .06

 22 JD         INDEX STORM NO. 2
                    STRM        1.55  PRECIPITATION DEPTH
                    TRDA        1.00  TRANSPOSITION DRAINAGE AREA

  0 PI          PRECIPITATION PATTERN
                   1.20      1.54      2.22      1.26       .78      1.02      1.10      1.26      1.06       .96
                    .36       .24       .00       .00       .00       .00       .00       .00       .00       .00
                    .18       .26       .42       .22       .12       .36       .44       .60       .76       .84
                    .54       .54       .54       .46       .42       .12       .10       .06       .06       .06
                    .18       .32       .60       .80       .90       .72       .64       .48       .24       .12
                    .30       .48       .84       .60       .48       .18       .16       .12       .52       .72
                   1.62      1.68      1.80      2.88      3.42      5.40      5.42      5.46      6.62      7.20
                   2.04      2.10      2.22      1.98      1.86       .42       .60       .96       .96       .96
                    .30       .28       .24       .40       .48       .48       .56       .72      1.12      1.32
                    .96       .86       .66       .74       .78      1.20       .92       .36       .36       .36
                    .18       .16       .12       .12       .12       .06       .10       .18       .06       .00
                    .06       .06       .06       .14       .18       .00       .02       .06       .06       .06
```

23 JD INDEX STORM NO. 3
STRM 1.38 PRECIPITATION DEPTH
TRDA 9.99 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

1.20	1.54	2.22	1.26	.78	1.02	1.10	1.26	1.06	.96
.36	.24	.00	.00	.00	.00	.00	.00	.00	.00
.18	.26	.42	.22	.12	.36	.44	.60	.76	.84
.54	.54	.54	.46	.42	.12	.10	.06	.06	.06
.18	.32	.60	.80	.90	.72	.64	.48	.24	.12
.30	.48	.84	.60	.48	.18	.16	.12	.52	.72
1.62	1.68	1.80	2.88	3.42	5.40	5.42	5.46	6.62	7.20
2.04	2.10	2.22	1.98	1.86	.42	.60	.96	.96	.96
.30	.28	.24	.40	.48	.48	.56	.72	1.12	1.32
.96	.86	.66	.74	.78	1.20	.92	.36	.36	.36
.18	.16	.12	.12	.12	.06	.10	.18	.06	.00
.06	.06	.06	.14	.18	.00	.02	.06	.06	.06

24 JD INDEX STORM NO. 4
STRM 1.38 PRECIPITATION DEPTH
TRDA 10.01 TRANSPOSITION DRAINAGE AREA

25 PI PRECIPITATION PATTERN

1.20	1.58	2.34	1.62	1.26	1.80	1.88	2.04	.92	.36
.60	.56	.48	.28	.18	.54	.40	.12	.24	.30
.18	.26	.42	.34	.30	.48	.52	.60	.60	.60
.66	.62	.54	.54	.54	.36	.54	.90	.70	.60
.60	.50	.30	.26	.24	.06	.18	.42	.30	.24
.36	.36	.36	.64	.78	.90	1.00	1.20	1.48	1.62
1.32	1.82	2.82	2.42	2.22	2.82	3.26	4.14	4.58	4.80
.60	.62	.66	1.06	1.26	1.62	1.30	.66	.42	.30
.54	.48	.36	.52	.60	.36	.52	.84	1.04	1.14
1.80	1.62	1.26	1.54	1.68	1.68	1.20	.24	.24	.24
.30	.24	.12	.12	.12	.12	.16	.24	.12	.06
.12	.10	.06	.14	.18	.06	.08	.12	.08	.06

33 JD INDEX STORM NO. 5
STRM 1.26 PRECIPITATION DEPTH
TRDA 20.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

1.20	1.58	2.34	1.62	1.26	1.80	1.88	2.04	.92	.36
.60	.56	.48	.28	.18	.54	.40	.12	.24	.30
.18	.26	.42	.34	.30	.48	.52	.60	.60	.60
.66	.62	.54	.54	.54	.36	.54	.90	.70	.60
.60	.50	.30	.26	.24	.06	.18	.42	.30	.24
.36	.36	.36	.64	.78	.90	1.00	1.20	1.48	1.62
1.32	1.82	2.82	2.42	2.22	2.82	3.26	4.14	4.58	4.80
.60	.62	.66	1.06	1.26	1.62	1.30	.66	.42	.30
.54	.48	.36	.52	.60	.36	.52	.84	1.04	1.14
1.80	1.62	1.26	1.54	1.68	1.68	1.20	.24	.24	.24
.30	.24	.12	.12	.12	.12	.16	.24	.12	.06
.12	.10	.06	.14	.18	.06	.08	.12	.08	.06

34 JD INDEX STORM NO. 6
STRM 1.18 PRECIPITATION DEPTH
TRDA 30.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

1.20	1.58	2.34	1.62	1.26	1.80	1.88	2.04	.92	.36
.60	.56	.48	.28	.18	.54	.40	.12	.24	.30
.18	.26	.42	.34	.30	.48	.52	.60	.60	.60
.66	.62	.54	.54	.54	.36	.54	.90	.70	.60
.60	.50	.30	.26	.24	.06	.18	.42	.30	.24
.36	.36	.36	.64	.78	.90	1.00	1.20	1.48	1.62
1.32	1.82	2.82	2.42	2.22	2.82	3.26	4.14	4.58	4.80
.60	.62	.66	1.06	1.26	1.62	1.30	.66	.42	.30
.54	.48	.36	.52	.60	.36	.52	.84	1.04	1.14
1.80	1.62	1.26	1.54	1.68	1.68	1.20	.24	.24	.24
.30	.24	.12	.12	.12	.12	.16	.24	.12	.06
.12	.10	.06	.14	.18	.06	.08	.12	.08	.06

35 JD INDEX STORM NO. 7
STRM 1.09 PRECIPITATION DEPTH
TRDA 50.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

1.20	1.58	2.34	1.62	1.26	1.80	1.88	2.04	.92	.36
.60	.56	.48	.28	.18	.54	.40	.12	.24	.30
.18	.26	.42	.34	.30	.48	.52	.60	.60	.60
.66	.62	.54	.54	.54	.36	.54	.90	.70	.60
.60	.50	.30	.26	.24	.06	.18	.42	.30	.24
.36	.36	.36	.64	.78	.90	1.00	1.20	1.48	1.62
1.32	1.82	2.82	2.42	2.22	2.82	3.26	4.14	4.58	4.80
.60	.62	.66	1.06	1.26	1.62	1.30	.66	.42	.30
.54	.48	.36	.52	.60	.36	.52	.84	1.04	1.14
1.80	1.62	1.26	1.54	1.68	1.68	1.20	.24	.24	.24
.30	.24	.12	.12	.12	.12	.16	.24	.12	.06
.12	.10	.06	.14	.18	.06	.08	.12	.08	.06

36 JD INDEX STORM NO. 8

STRM .96 PRECIPITATION DEPTH

TRDA 100.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

1.20	1.58	2.34	1.62	1.26	1.80	1.88	2.04	.92	.36
.60	.56	.48	.28	.18	.54	.40	.12	.24	.30
.18	.26	.42	.34	.30	.48	.52	.60	.60	.60
.66	.62	.54	.54	.54	.36	.54	.90	.70	.60
.60	.50	.30	.26	.24	.06	.18	.42	.30	.24
.36	.36	.36	.64	.78	.90	1.00	1.20	1.48	1.62
1.32	1.82	2.82	2.42	2.22	2.82	3.26	4.14	4.58	4.80
.60	.62	.66	1.06	1.26	1.62	1.30	.66	.42	.30
.54	.48	.36	.52	.60	.36	.52	.84	1.04	1.14
1.80	1.62	1.26	1.54	1.68	1.68	1.20	.24	.24	.24
.30	.24	.12	.12	.12	.12	.16	.24	.12	.06
.12	.10	.06	.14	.18	.06	.08	.12	.08	.06

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	MM1A	174.	3.80	30.	12.	12.	.90		
+	HYDROGRAPH AT	BW1	1786.	6.35	961.	405.	405.	60.50		
+	HYDROGRAPH AT	BW2	1016.	5.40	389.	156.	156.	20.80		
+	2 COMBINED AT	BW1&2	1848.	5.95	1003.	421.	421.	81.30		
+	2 COMBINED AT	BW APX	1841.	5.95	1004.	421.	421.	82.20		
+	HYDROGRAPH AT	MM1B	200.	4.05	47.	19.	19.	2.10		
+	HYDROGRAPH AT	MM2	184.	4.00	41.	16.	16.	1.40		
+	HYDROGRAPH AT	HP1A	200.	3.95	42.	17.	17.	.80		
+	HYDROGRAPH AT	HP1B	116.	4.05	27.	11.	11.	1.00		
+	HYDROGRAPH AT	HP2	136.	4.05	32.	13.	13.	1.20		
+	4 COMBINED AT	CPA1	459.	4.15	120.	48.	48.	4.40		
+	HYDROGRAPH AT	HP3	263.	4.10	64.	26.	26.	1.70		
+	2 COMBINED AT	CPA2	659.	4.15	170.	68.	68.	6.10		
+	HYDROGRAPH AT	HP4	360.	4.05	86.	35.	35.	3.30		
+	HYDROGRAPH AT	HP5	206.	3.80	36.	14.	14.	1.20		
+	HYDROGRAPH AT	HP6	277.	4.10	67.	27.	27.	2.20		
+	ROUTED TO	RTCPD	268.	4.35	67.	27.	27.	2.20		
+	HYDROGRAPH AT	HPFA	41.	3.85	8.	3.	3.	.30		
+	3 COMBINED AT	CPD	333.	4.25	99.	40.	40.	3.70		
+	ROUTED TO	RTCPE	326.	4.65	99.	40.	40.	3.70		
+	HYDROGRAPH AT	HPFB	167.	4.00	37.	15.	15.	1.60		
+	3 COMBINED AT	CPE	603.	4.20	191.	77.	77.	8.60		
+	2 COMBINED AT	CPF	878.	5.15	301.	121.	121.	14.70		
+	HYDROGRAPH AT	SC1	1251.	6.35	673.	283.	283.	39.40		

```
*****************************************                    *****************************************
*                                       *                    *                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *   U.S. ARMY CORPS OF ENGINEERS        *
*             SEPTEMBER 1990            *                    *   HYDROLOGIC ENGINEERING CENTER       *
*               VERSION 4.0             *                    *        609 SECOND STREET              *
*                                       *                    *     DAVIS, CALIFORNIA 95616           *
*  RUN DATE  01/29/1993  TIME  21:59:18 *                    *         (916) 756-1104                *
*                                       *                    *                                       *
*****************************************                    *****************************************


                         X     X  XXXXXXX   XXXXX        X
                         X     X  X        X     X      XX
                         X     X  X        X             X
                         XXXXXXX  XXXX     X     XXXXX   X
                         X     X  X        X             X
                         X     X  X        X     X       X
                         X     X  XXXXXXX   XXXXX       XXX


  THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

  THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
  THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
  NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
  DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
  KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


    1           ID   FLOOD ASSESSMENT FOR RWMS JOB #:51056         FILE: RWMSCN.DAT
    2           ID   100-YEAR 6-HOUR STORM 1.6 INCHES
    3           ID   POINT RAINFALL VALUES FROM NOAA ATLAS 2 VOL VII
    4           ID   DEPTH-AREA REDUCTION FACTORS FROM TABLE 502 IN
    5           ID   CLARK COUNTY HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MODEL (CCRFCD, 1990)
    6           ID   CURVE NUMBERS DETERMINED USING TABLE 602 IN CCRFCD, 1990
    7           ID   LAG TIMES DETERMINED USING METHOD IN SECTION 606.3 IN CCRFCD, 1990
    8           ID   DRAINAGE AREAS FROM 7.5 MINUTE AND 15 MINUTE QUADS
    9           ID   THIS MODEL ADDRESSES DRAINAGES THAT COULD IMPACT THE RWMS
   10           ID   ADJUSTED CURVE NUMBERS BY 5 TO ACCOUNT FOR MOISTER SOILS DURING THE 100-YR EV
                *DIAGRAM
   11           IT       3       0       0     300
   12           IO       5
   13           IN       5
   14           JD     1.6     .01
                * RAINFALL DISTRIBUTION FROM CLARK COUNTY MANUAL LESS THAN 10 SQ. MILES
   15           PC       0       2     5.7     7.0     8.7    10.8    12.4    13.0    13.0    13.0
   16           PC    13.0    13.0    13.0    13.3    14.0    14.2    14.8    15.8    17.2    18.1
   17           PC    19.0    19.7    19.9    20.0    20.1    20.4    21.4    22.9    24.1    24.9
   18           PC    25.1    25.6    27.0    27.8    28.1    28.3    29.5    32.2    35.2    40.9
   19           PC    49.9    59.0    71.0    74.4    78.1    81.2    81.9    83.5    85.1    85.6
   20           PC    86.0    86.8    87.6    88.8    91.0    92.6    93.7    95.0    97.0    97.6
   21           PC    98.2    98.5    98.7    98.9    99.0    99.3    99.3    99.4    99.5    99.8
   22           PC    99.8    99.9   100.0
   23           JD    1.55       1
   24           JD    1.38    9.99
                * CHANGED RAINFALL DISTRIBUTION ABOVE 10 SQ. MILES PER CLARK COUNTY MANUAL
   25           JD    1.38   10.01
   26           PC       0     2.0     5.9     8.0    11.0    14.4    15.0    16.0    16.8    17.1
   27           PC    18.0    18.2    18.7    19.0    19.7    20.2    21.0    22.0    23.0    24.1
   28           PC    25.0    25.9    26.5    28.0    29.0    30.0    30.5    30.9    31.0    31.7
   29           PC    32.1    32.7    33.3    34.6    36.1    38.1    40.8    43.0    47.7    51.4
   30           PC    56.1    63.0    71.0    72.0    73.1    75.2    77.9    79.0    79.5    80.4
   31           PC    81.0    82.0    82.6    84.0    85.9    88.9    91.0    93.8    96.6    97.0
   32           PC    97.4    97.9    98.1    98.3    98.5    98.9    99.0    99.2    99.3    99.6
   33           PC    99.7    99.9   100.0
   34           JD    1.26      20
   35           JD    1.18      30
   36           JD    1.09      50
   37           JD     .96     100

   38           KK    MM1A
   39           KM   Basin runoff calculation for Mass. Mountains 1A
   40           BA      .9
   41           LS              85
   42           UD     .31

   43           KK     BW1
   44           KM     Basin runoff calculation for Barren Wash 1
   45           BA    60.5
   46           LS              88
   47           UD     2.1
```

```
 48   KK     BW2
 49   KM     Basin runoff calculation for Barren Wash 2
 50   BA    20.8
 51   LS              85
 52   UD      .9

 53   KK    BW1&2
 54   KM    Combined BW1 and BW2
 55   HC       2

 56   KK   BW APX
 57   KM    Combine BW1,BW2, and MM1A (assume dischcarge of Barren Wash "active apex")
 58   HC       2

 59   KK     MM1B
 60   KM     Basin runoff calulation for Mass. Mountains 1B
      *    Flow was not combined with BW APX because flow from this watershed
      *    will not directly impact RWMS wereas a channel migration at the apex
      *    could impact the RWMS
 61   BA      2.1
 62   LS              82
 63   UD     .48

 64   KK      MM2
 65   KM     Basin runoff calculation for Mass. Mountains 2
 66   BA      1.4
 67   LS              84
 68   UD     .47

 69   KK     HP1A
 70   KM     Basin runoff calculation for Half Pint Range 1A
 71   BA       .8
 72   LS              90
 73   UD     .48

 74   KK    RTCPA
 75   KM    Route Flow from HP1A to CPA
 76   RM        9     .43      .2

 77   KK     HP1B
 78   KM     Basin runoff calculation for Half Pint Range 1B
 79   BA      1.0
 80   LS              83
 81   UD     .51

 82   KK      HP2
 83   KM     Basin runoff calculation for Half Pint Range 2
 84   BA     1.2
 85   LS              83
 86   UD      .51

 87   KK     CPA1
 88   KM     Combine MM2, routed HP1A, HP1B, HP2
 89   HC        4

 90   KK      HP3
 91   KM      (CPB) Basin runoff calculation for Half Pint Range 3
 92   BA      1.7
 93   LS              87
 94   UD      .59

 95   KK     CPA2
 96   KM     Combine HP3 with flow from CPA1
 97   HC        2

 98   KK      HP4
 99   KM      (CPC) Basin runoff calculation for Half Pint Range 4
100   BA      3.3
101   LS              84
102   UD      .52

103   KK      HP5
104   KM      Basin runoff calculation for Half Pint Range 5
105   BA      1.2
106   LS              84
107   UD       .3

108   KK      HP6
109   KM      Basin runoff calculation for Half Pint Range 6
110   BA      2.2
111   LS              85
112   UD      .55

113   KK    RTCPD
114   KM     Route HP6 to CPD
115   RM        5     .27      .2
```

```
KK     HPFA
KM      Basin runoff calculation for Half Pint Range FA
BA       .3
LS               82
UD      .33

KK      CPD
KM      Combine HP5, routed HP6, and HPFA
HC        3

KK    RTCPE
KM      Route flow from CPD to CPE
RM        8      .39      .2

KK      HPFB
KM      Basin runoff calculation for Half Pint Range FB
BA      1.6
LS               82
UD      .44

KK      CPE
KM     Combine HP4 (CPC) with routed flow from CPD, and HPFB
HC        3

KK      CPF
KM     Combine all flow at Concentration just below RWMS (Flow from CPA & CPE)
HC        2

KK      SC1
KM      Basin runoff calculation for Scarp Canyon 1
* Concentration Pt of this watershed is the active apex of the Scarp Canyon Fan
BA     39.4
LS               87
UD      2.1

KK      SC2
KM      Basin runoff calculation for Scarp Canyon 2
BA      1.5
LS               82
UD      .48
ZZ
```

```
                    SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE     (V) ROUTING         (--->) DIVERSION OR PUMP FLOW

  NO.     (.) CONNECTOR       (<---) RETURN OF DIVERTED OR PUMPED FLOW

 38          MM1A
                .
                .
 43             .         BW1
                .           .
                .           .
 48             .           .         BW2
                .           .           .
                .           .           .
 53             .       BW1&2............
                .           .
                .           .
 56        BW APX............
                .
                .
 59             .        MM1B
                .           .
                .           .
 64             .           .         MM2
                .           .           .
                .           .           .
 69             .           .           .        HP1A
                .           .           .           V
                .           .           .           V
 74             .           .           .       RTCPA
                .           .           .           .
                .           .           .           .
 77             .           .           .           .        HP1B
                .           .           .           .           .
                .           .           .           .           .
 82             .           .           .           .           .         HP2
                .           .           .           .           .           .
                .           .           .           .           .           .
 87             .           .        CPA1....................................
                .           .           .
                .           .           .
 90             .           .           .         HP3
                .           .           .           .
                .           .           .           .
 95             .           .        CPA2............
                .           .           .
                .           .           .
 98             .           .           .         HP4
                .           .           .           .
                .           .           .           .
103             .           .           .           .         HP5
                .           .           .           .           .
                .           .           .           .           .
108             .           .           .           .           .         HP6
                .           .           .           .           .           V
                .           .           .           .           .           V
113             .           .           .           .           .       RTCPD
                .           .           .           .           .           .
                .           .           .           .           .           .
116             .           .           .           .           .           .        HPFA
                .           .           .           .           .           .           .
                .           .           .           .           .           .           .
121             .           .           .           .         CPD........................
                .           .           .           .           V
                .           .           .           .           V
124             .           .           .           .      RTCPE
                .           .           .           .           .
                .           .           .           .           .
127             .           .           .           .           .        HPFB
                .           .           .           .           .           .
                .           .           .           .           .           .
132             .           .           .         CPE........................
                .           .           .           .
                .           .           .           .
135             .           .         CPF............
                .           .           .
                .           .           .
138             .           .           .         SC1
                .           .           .           .
                .           .           .           .
143             .           .           .           .         SC2
(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
```

```
*****************************************                 *****************************************
*                                       *                 *                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                 *   U.S. ARMY CORPS OF ENGINEERS        *
*           SEPTEMBER 1990              *                 *   HYDROLOGIC ENGINEERING CENTER       *
*            VERSION 4.0                *                 *        609 SECOND STREET              *
*                                       *                 *     DAVIS, CALIFORNIA 95616           *
* RUN DATE  01/29/1993  TIME  21:59:18  *                 *        (916) 756-1104                 *
*                                       *                 *                                       *
*****************************************                 *****************************************
```

```
FLOOD ASSESSMENT FOR RWMS JOB #:51056          FILE: RWMSCN.DAT
100-YEAR 6-HOUR STORM 1.6 INCHES
POINT RAINFALL VALUES FROM NOAA ATLAS 2 VOL VII
DEPTH-AREA REDUCTION FACTORS FROM TABLE 502 IN
CLARK COUNTY HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MODEL (CCRFCD, 1990)
CURVE NUMBERS DETERMINED USING TABLE 602 IN CCRFCD, 1990
LAG TIMES DETERMINED USING METHOD IN SECTION 606.3 IN CCRFCD, 1990
DRAINAGE AREAS FROM 7.5 MINUTE AND 15 MINUTE QUADS
THIS MODEL ADDRESSES DRAINAGES THAT COULD IMPACT THE RWMS
ADJUSTED CURVE NUMBERS BY 5 TO ACCOUNT FOR MOISTER SOILS DURING THE 100-YR EV
```

```
  IT IO        OUTPUT CONTROL VARIABLES
                IPRNT           5  PRINT CONTROL
                IPLOT           0  PLOT CONTROL
                QSCAL          0.  HYDROGRAPH PLOT SCALE

  IT          HYDROGRAPH TIME DATA
                 NMIN           3  MINUTES IN COMPUTATION INTERVAL
                IDATE       1   0  STARTING DATE
                ITIME        0000  STARTING TIME
                   NQ         300  NUMBER OF HYDROGRAPH ORDINATES
               NDDATE       1   0  ENDING DATE
               NDTIME        1457  ENDING TIME
                ICENT          19  CENTURY MARK

          COMPUTATION INTERVAL    .05 HOURS
               TOTAL TIME BASE  14.95 HOURS

        ENGLISH UNITS
            DRAINAGE AREA          SQUARE MILES
            PRECIPITATION DEPTH    INCHES
            LENGTH, ELEVATION      FEET
            FLOW                   CUBIC FEET PER SECOND
            STORAGE VOLUME         ACRE-FEET
            SURFACE AREA           ACRES
            TEMPERATURE            DEGREES FAHRENHEIT

 14 JD          INDEX STORM NO. 1
                 STRM        1.60  PRECIPITATION DEPTH
                 TRDA         .01  TRANSPOSITION DRAINAGE AREA

 15 PI            PRECIPITATION PATTERN
```

1.20	1.54	2.22	1.26	.78	1.02	1.10	1.26	1.06	.96
.36	.24	.00	.00	.00	.00	.00	.00	.00	.00
.18	.26	.42	.22	.12	.36	.44	.60	.76	.84
.54	.54	.54	.46	.42	.12	.10	.06	.06	.06
.18	.32	.60	.80	.90	.72	.64	.48	.24	.12
.30	.48	.84	.60	.48	.18	.16	.12	.52	.72
1.62	1.68	1.80	2.88	3.42	5.40	5.42	5.46	6.62	7.20
2.04	2.10	2.22	1.98	1.86	.42	.60	.96	.96	.96
.30	.28	.24	.40	.48	.48	.56	.72	1.12	1.32
.96	.86	.66	.74	.78	1.20	.92	.36	.36	.36
.18	.16	.12	.12	.12	.06	.10	.18	.06	.00
.06	.06	.06	.14	.18	.00	.02	.06	.06	.06

```
 23 JD          INDEX STORM NO. 2
                 STRM        1.55  PRECIPITATION DEPTH
                 TRDA        1.00  TRANSPOSITION DRAINAGE AREA

  0 PI            PRECIPITATION PATTERN
```

1.20	1.54	2.22	1.26	.78	1.02	1.10	1.26	1.06	.96
.36	.24	.00	.00	.00	.00	.00	.00	.00	.00
.18	.26	.42	.22	.12	.36	.44	.60	.76	.84
.54	.54	.54	.46	.42	.12	.10	.06	.06	.06
.18	.32	.60	.80	.90	.72	.64	.48	.24	.12
.30	.48	.84	.60	.48	.18	.16	.12	.52	.72
1.62	1.68	1.80	2.88	3.42	5.40	5.42	5.46	6.62	7.20

```
24 JD        INDEX STORM NO. 3
                   STRM        1.38  PRECIPITATION DEPTH
                   TRDA        9.99  TRANSPOSITION DRAINAGE AREA

 0 PI          PRECIPITATION PATTERN
                1.20     1.54     2.22     1.26      .78     1.02     1.10     1.26     1.06      .96
                 .36      .24      .00      .00      .00      .00      .00      .00      .00      .00
                 .18      .26      .42      .22      .12      .36      .44      .60      .76      .84
                 .54      .54      .54      .46      .42      .12      .10      .06      .06      .06
                 .18      .32      .60      .80      .90      .72      .64      .48      .24      .12
                 .30      .48      .84      .60      .48      .18      .16      .12      .52      .72
                1.62     1.68     1.80     2.88     3.42     5.40     5.42     5.46     6.62     7.20
                2.04     2.10     2.22     1.98     1.86      .42      .60      .96      .96      .96
                 .30      .28      .24      .40      .48      .48      .56      .72     1.12     1.32
                 .96      .86      .66      .74      .78     1.20      .92      .36      .36      .36
                 .18      .16      .12      .12      .12      .06      .10      .18      .06      .00
                 .06      .06      .06      .14      .18      .00      .02      .06      .06      .06

25 JD        INDEX STORM NO. 4
                   STRM        1.38  PRECIPITATION DEPTH
                   TRDA       10.01  TRANSPOSITION DRAINAGE AREA

26 PI          PRECIPITATION PATTERN
                1.20     1.58     2.34     1.62     1.26     1.80     1.88     2.04      .92      .36
                 .60      .56      .48      .28      .18      .54      .40      .12      .24      .30
                 .18      .26      .42      .34      .30      .48      .52      .60      .60      .60
                 .66      .62      .54      .54      .54      .36      .54      .90      .70      .60
                 .60      .50      .30      .26      .24      .06      .18      .42      .30      .24
                 .36      .36      .36      .64      .78      .90     1.00     1.20     1.48     1.62
                1.32     1.82     2.82     2.42     2.22     2.82     3.26     4.14     4.58     4.80
                 .60      .62      .66     1.06     1.26     1.62     1.30      .66      .42      .30
                 .54      .48      .36      .52      .60      .36      .52      .84     1.04     1.14
                1.80     1.62     1.26     1.54     1.68     1.68     1.20      .24      .24      .24
                 .30      .24      .12      .12      .12      .12      .16      .24      .12      .06
                 .12      .10      .06      .14      .18      .06      .08      .12      .08      .06

34 JD        INDEX STORM NO. 5
                   STRM        1.26  PRECIPITATION DEPTH
                   TRDA       20.00  TRANSPOSITION DRAINAGE AREA

 0 PI          PRECIPITATION PATTERN
                1.20     1.58     2.34     1.62     1.26     1.80     1.88     2.04      .92      .36
                 .60      .56      .48      .28      .18      .54      .40      .12      .24      .30
                 .18      .26      .42      .34      .30      .48      .52      .60      .60      .60
                 .66      .62      .54      .54      .54      .36      .54      .90      .70      .60
                 .60      .50      .30      .26      .24      .06      .18      .42      .30      .24
                 .36      .36      .36      .64      .78      .90     1.00     1.20     1.48     1.62
                1.32     1.82     2.82     2.42     2.22     2.82     3.26     4.14     4.58     4.80
                 .60      .62      .66     1.06     1.26     1.62     1.30      .66      .42      .30
                 .54      .48      .36      .52      .60      .36      .52      .84     1.04     1.14
                1.80     1.62     1.26     1.54     1.68     1.68     1.20      .24      .24      .24
                 .30      .24      .12      .12      .12      .12      .16      .24      .12      .06
                 .12      .10      .06      .14      .18      .06      .08      .12      .08      .06

35 JD        INDEX STORM NO. 6
                   STRM        1.18  PRECIPITATION DEPTH
                   TRDA       30.00  TRANSPOSITION DRAINAGE AREA

 0 PI          PRECIPITATION PATTERN
                1.20     1.58     2.34     1.62     1.26     1.80     1.88     2.04      .92      .36
                 .60      .56      .48      .28      .18      .54      .40      .12      .24      .30
                 .18      .26      .42      .34      .30      .48      .52      .60      .60      .60
                 .66      .62      .54      .54      .54      .36      .54      .90      .70      .60
                 .60      .50      .30      .26      .24      .06      .18      .42      .30      .24
                 .36      .36      .36      .64      .78      .90     1.00     1.20     1.48     1.62
                1.32     1.82     2.82     2.42     2.22     2.82     3.26     4.14     4.58     4.80
                 .60      .62      .66     1.06     1.26     1.62     1.30      .66      .42      .30
                 .54      .48      .36      .52      .60      .36      .52      .84     1.04     1.14
                1.80     1.62     1.26     1.54     1.68     1.68     1.20      .24      .24      .24
                 .30      .24      .12      .12      .12      .12      .16      .24      .12      .06
                 .12      .10      .06      .14      .18      .06      .08      .12      .08      .06

36 JD        INDEX STORM NO. 7
                   STRM        1.09  PRECIPITATION DEPTH
                   TRDA       50.00  TRANSPOSITION DRAINAGE AREA

 0 PI          PRECIPITATION PATTERN
                1.20     1.58     2.34     1.62     1.26     1.80     1.88     2.04      .92      .36
                 .60      .56      .48      .28      .18      .54      .40      .12      .24      .30
                 .18      .26      .42      .34      .30      .48      .52      .60      .60      .60
                 .66      .62      .54      .54      .54      .36      .54      .90      .70      .60
                 .60      .50      .30      .26      .24      .06      .18      .42      .30      .24
                 .36      .36      .36      .64      .78      .90     1.00     1.20     1.48     1.62
                1.32     1.82     2.82     2.42     2.22     2.82     3.26     4.14     4.58     4.80
                 .60      .62      .66     1.06     1.26     1.62     1.30      .66      .42      .30
                 .54      .48      .36      .52      .60      .36      .52      .84     1.04     1.14
                1.80     1.62     1.26     1.54     1.68     1.68     1.20      .24      .24      .24
                 .30      .24      .12      .12      .12      .12      .16      .24      .12      .06
                 .12      .10      .06      .14      .18      .06      .08       12      .08      .06
```

37 JD INDEX STORM NO. 8

STRM .96 PRECIPITATION DEPTH

TRDA 100.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

1.20	1.58	2.34	1.62	1.26	1.80	1.88	2.04	.92	.36
.60	.56	.48	.28	.18	.54	.40	.12	.24	.30
.18	.26	.42	.34	.30	.48	.52	.60	.60	.60
.66	.62	.54	.54	.54	.36	.54	.90	.70	.60
.60	.50	.30	.26	.24	.06	.18	.42	.30	.24
.36	.36	.36	.64	.78	.90	1.00	1.20	1.48	1.62
1.32	1.82	2.82	2.42	2.22	2.82	3.26	4.14	4.58	4.80
.60	.62	.66	1.06	1.26	1.62	1.30	.66	.42	.30
.54	.48	.36	.52	.60	.36	.52	.84	1.04	1.14
1.80	1.62	1.26	1.54	1.68	1.68	1.20	.24	.24	.24
.30	.24	.12	.12	.12	.12	.16	.24	.12	.06
.12	.10	.06	.14	.18	.06	.08	.12	.08	.06

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	MM1A	284.	3.75	47.	19.	19.	.90		
+	HYDROGRAPH AT	BW1	3190.	6.15	1762.	745.	745.	60.50		
+	HYDROGRAPH AT	BW2	1645.	4.40	678.	273.	273.	20.80		
+	2 COMBINED AT	BW1&2	3513.	5.75	1943.	817.	817.	81.30		
+	2 COMBINED AT	BW APX	3506.	5.75	1948.	819.	819.	82.20		
+	HYDROGRAPH AT	MM1B	361.	4.00	78.	31.	31.	2.10		
+	HYDROGRAPH AT	MM2	311.	3.95	65.	26.	26.	1.40		
+	HYDROGRAPH AT	HP1A	300.	3.95	62.	25.	25.	.80		
+	ROUTED TO	RTCPA	284.	4.35	62.	25.	25.	.80		
+	HYDROGRAPH AT	HP1B	200.	4.00	44.	18.	18.	1.00		
+	HYDROGRAPH AT	HP2	235.	4.00	52.	21.	21.	1.20		
+	4 COMBINED AT	CPA1	786.	4.10	194.	78.	78.	4.40		
+	HYDROGRAPH AT	HP3	420.	4.10	99.	40.	40.	1.70		
+	2 COMBINED AT	CPA2	1126.	4.10	274.	110.	110.	6.10		
+	HYDROGRAPH AT	HP4	626.	4.00	139.	56.	56.	3.30		
+	HYDROGRAPH AT	HP5	345.	3.75	56.	23.	23.	1.20		
+	HYDROGRAPH AT	HP6	465.	4.05	106.	42.	42.	2.20		
+	ROUTED TO	RTCPD	449.	4.30	106.	42.	42.	2.20		
+	HYDROGRAPH AT	HPFA	71.	3.80	12.	5.	5.	.30		
+	3 COMBINED AT	CPD	570.	4.20	161.	64.	64.	3.70		
+	ROUTED TO	RTCPE	558.	4.55	161.	64.	64.	3.70		
+	HYDROGRAPH AT	HPFB	299.	3.95	61.	25.	25.	1.60		
+	3 COMBINED AT	CPE	1108.	4.15	319.	128.	128.	8.60		
+	2 COMBINED AT	CPF	1462.	4.10	513.	206.	206.	14.70		
+	HYDROGRAPH AT	SC1	2178.	6.15	1201.	508.	508.	39.40		
+	HYDROGRAPH AT	SC2	269.	4.00	58.	23.	23.	1.50		

*** NORMAL END OF HEC-1 ***

HEC-1 MODEL OUTPUT

FILENAME: RWMSW.OUT

(100-YEAR MODEL)

```
******************************************                    ******************************************
*                                        *                    *                                        *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)    *                    *   U.S. ARMY CORPS OF ENGINEERS         *
*           SEPTEMBER 1990               *                    *   HYDROLOGIC ENGINEERING CENTER        *
*            VERSION 4.0                 *                    *        609 SECOND STREET               *
*                                        *                    *     DAVIS, CALIFORNIA 95616            *
* RUN DATE  01/29/1993  TIME  22:01:21   *                    *         (916) 756-1104                 *
*                                        *                    *                                        *
******************************************                    ******************************************



                         X     X  XXXXXXX   XXXXX           X
                         X     X  X        X     X         XX
                         X     X  X        X                X
                         XXXXXXX  XXXX     X       XXXXX    X
                         X     X  X        X                X
                         X     X  X        X     X          X
                         X     X  XXXXXXX   XXXXX          XXX



THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1        1         ID   FLOOD ASSESSMENT FOR RWMS JOB #:51056        FILE: RWMSW.DAT
         2         ID   100-YEAR 6-HOUR STORM 1.6 INCHES
         3         ID   POINT RAINFALL VALUES FROM NOAA ATLAS 2 VOL VII
         4         ID   DEPTH-AREA REDUCTION FACTORS FROM TABLE 502 IN
         5         ID   CLARK COUNTY HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MAUAL (CCRFCD, 1990)
         6         ID   CURVE NUMBER DETERMINED USING TABLE 602 IN CCRFCD, 1990
         7         ID   LAG TIMES DETERMINED USING METHOD IN SECTION 606.3 IN CCRFCD, 1990
         8         ID   DRAINAGE AREAS FROM 7.5 MINUTE AND 15 MINUTE QUADS
         9         ID   THIS MODEL ADDRESSES DRAINAGES THAT COULD IMPACT THE RWMS
        10         ID   ADJUSTED CURVE NUMBERS BY 10 TO ACCOUNT FOR MOISTER SOILS DURING THE 100-YR E
                   *DIAGRAM
        11         IT       3       0       0     300
        12         IO       5
        13         IN       5
        14         JD     1.6     .01
                   * RAINFALL DISTRIBUTION FROM CLARK COUNTY MANUAL LESS THAN 10 SQ. MILES
        15         PC       0       2     5.7     7.0     8.7    10.8    12.4    13.0    13.0    13.0
        16         PC    13.0    13.0    13.0    13.3    14.0    14.2    14.8    15.8    17.2    18.1
        17         PC    19.0    19.7    19.9    20.0    20.1    20.4    21.4    22.9    24.1    24.9
        18         PC    25.1    25.6    27.0    27.8    28.1    28.3    29.5    32.2    35.2    40.9
        19         PC    49.9    59.0    71.0    74.4    78.1    81.2    81.9    83.5    85.1    85.6
        20         PC    86.0    86.8    87.6    88.8    91.0    92.6    93.7    95.0    97.0    97.6
        21         PC    98.2    98.5    98.7    98.9    99.0    99.3    99.3    99.4    99.5    99.8
        22         PC    99.8    99.9   100.0
        23         JD    1.55       1
        24         JD    1.38    9.99
                   * CHANGED RAINFALL DISTRIBUTION ABOVE 10 SQ. MILES PER CLARK COUNTY MANUAL
        25         JD    1.38   10.01
        26         PC       0     2.0     5.9     8.0    11.0    14.4    15.0    16.0    16.8    17.1
        27         PC    18.0    18.2    18.7    19.0    19.7    20.2    21.0    22.0    23.0    24.1
        28         PC    25.0    25.9    26.5    28.0    29.0    30.0    30.5    30.9    31.0    31.7
        29         PC    32.1    32.7    33.3    34.6    36.1    38.1    40.8    43.0    47.7    51.4
        30         PC    56.1    63.0    71.0    72.0    73.1    75.2    77.9    79.0    79.5    80.4
        31         PC    81.0    82.0    82.6    84.0    85.9    88.9    91.0    93.8    96.6    97.0
        32         PC    97.4    97.9    98.1    98.3    98.5    98.9    99.0    99.2    99.3    99.6
        33         PC    99.7    99.9   100.0
        34         JD    1.26      20
        35         JD    1.18      30
        36         JD    1.09      50


        38         KK    MM1A
        39         KM   Basin runoff calculation for Mass. Mountains 1A
        40         BA      .9
        41         LS              90
        42         UD     .31

        43         KK     BW1
        44         KM    Basin runoff calculation for Barren Wash 1
        45         BA    60.5
        46         LS              93
        47         UD     2.1
```

```
KK    BW2
KM    Basin runoff calculation for Barren Wash 2
BA   20.8
LS             90
UD     .9

KK  BW1&2
KM  Combined BW1 and BW2
HC     2

KK BW APX
KM  Combine BW1,BW2, and MM1A (assume dischcarge of Barren Wash "active apex")
HC     2

KK    MM1B
KM   Basin runoff calulation for Mass. Mountains 1B
*   Flow was not combined with BW APX because flow from this watershed
*   will not directly impact RWMS wereas a channel migration at the apex
*   could impact the RWMS
BA    2.1
LS             87
UD    .48

KK    MM2
KM   Basin runoff calculation for Mass. Mountains 2
BA    1.4
LS             89
UD    .47

KK   HP1A
KM   Basin runoff calculation for Half Pint Range 1A
BA     .8
LS             95
UD    .48

KK  RTCPA
KM  Route Flow from HP1A to CPA
RM     9      .43      .2

KK   HP1B
KM   Basin runoff calculation for Half Pint Range 1B
BA    1.0
LS             88
UD    .51

KK    HP2
KM   Basin runoff calculation for Half Pint Range 2
BA   1.2
LS             88
UD    .51

KK   CPA1
KM   Combine MM2, routed HP1A, HP1B, HP2
HC     4

KK    HP3
KM    (CPB) Basin runoff calculation for Half Pint Range 3
BA    1.7
LS             92
UD    .59

KK   CPA2
KM   Combine HP3 with flow from CPA1
HC     2

KK    HP4
KM    (CPC) Basin runoff calculation for Half Pint Range 4
BA    3.3
LS             89
UD    .52

KK    HP5
KM    Basin runoff calculation for Half Pint Range 5
BA    1.2
LS             89
UD     .3

KK    HP6
KM    Basin runoff calculation for Half Pint Range 6
BA    2.2
LS             90
UD    .55

KK  RTCPD
KM   Route HP6 to CPD
RM     5      .27      .2
```

```
KK    HPFA
KM     Basin runoff calculation for Half Pint Range FA
BA       .3
LS                 87
UD      .33

KK     CPD
KM     Combine HP5, routed HP6, and HPFA
HC       3

KK   RTCPE
KM     Route flow from CPD to CPE
RM       8     .39      .2

KK    HPFB
KM     Basin runoff calculation for Half Pint Range FB
BA     1.6
LS                 87
UD      .44

KK     CPE
KM    Combine HP4 (CPC) with routed flow from CPD, and HPFB
HC       3

KK     CPF
KM    Combine all flow at Concentration just below RWMS (Flow from CPA & CPE)
HC       2

KK     SC1
KM     Basin runoff calculation for Scarp Canyon 1
* Concentration Pt of this watershed is the active apex of the Scarp Canyon Fan
BA    39.4
LS                 92
UD     2.1

KK     SC2
KM     Basin runoff calculation for Scarp Canyon 2
BA     1.5
LS                 87
UD      .48
ZZ
```

```
                SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

  NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

  38          MM1A
                 .
  43             .         BW1
                 .           .
  48             .           .         BW2
                 .           .           .
  53             .       BW1&2............
                 .           .
  56       BW APX.............
                 .
  59             .        MM1B
                 .           .
  64             .           .         MM2
                 .           .           .
  69             .           .           .        HP1A
                 .           .           .           V
                 .           .           .           V
  74             .           .           .       RTCPA
                 .           .           .           .
  77             .           .           .           .        HP1B
                 .           .           .           .           .
  82             .           .           .           .           .         HP2
                 .           .           .           .           .           .
  87             .           .        CPA1....................................
                 .           .           .
  90             .           .           .         HP3
                 .           .           .           .
  95             .           .        CPA2............
                 .           .           .
  98             .           .           .         HP4
                 .           .           .           .
 103             .           .           .           .         HP5
                 .           .           .           .           .
 108             .           .           .           .           .         HP6
                 .           .           .           .           .           V
                 .           .           .           .           .           V
 113             .           .           .           .           .       RTCPD
                 .           .           .           .           .           .
 116             .           .           .           .           .           .       HPFA
                 .           .           .           .           .           .          .
 121             .           .           .           .         CPD.......................
                 .           .           .           .           V
                 .           .           .           .           V
 124             .           .           .           .       RTCPE
                 .           .           .           .           .
 127             .           .           .           .           .        HPFB
                 .           .           .           .           .           .
 132             .           .           .         CPE........................
                 .           .           .           .
 135             .           .         CPF............
                 .           .           .
 138             .           .           .         SC1
                 .           .           .           .
 143             .           .           .           .         SC2
(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
```

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*           SEPTEMBER 1990              *
*             VERSION 4.0               *
*                                       *
* RUN DATE  01/29/1993  TIME  22:01:21  *
*                                       *
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*****************************************
*                                       *
*     U.S. ARMY CORPS OF ENGINEERS      *
*     HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

```
                  FLOOD ASSESSMENT FOR RWMS JOB #:51056         FILE: RWMSW.DAT
                  100-YEAR 6-HOUR STORM 1.6 INCHES
                  POINT RAINFALL VALUES FROM NOAA ATLAS 2 VOL VII
                  DEPTH-AREA REDUCTION FACTORS FROM TABLE 502 IN
                  CLARK COUNTY HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MAUAL (CCRFCD, 1990)
                  CURVE NUMBER DETERMINED USING TABLE 602 IN CCRFCD, 1990
                  LAG TIMES DETERMINED USING METHOD IN SECTION 606.3 IN CCRFCD, 1990
                  DRAINAGE AREAS FROM 7.5 MINUTE AND 15 MINUTE QUADS
                  THIS MODEL ADDRESSES DRAINAGES THAT COULD IMPACT THE RWMS
                  ADJUSTED CURVE NUMBERS BY 10 TO ACCOUNT FOR MOISTER SOILS DURING THE 100-YR E

 12 IO         OUTPUT CONTROL VARIABLES
                     IPRNT          5  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE

   IT          HYDROGRAPH TIME DATA
                      NMIN          3  MINUTES IN COMPUTATION INTERVAL
                     IDATE     1    0  STARTING DATE
                     ITIME       0000  STARTING TIME
                        NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE     1    0  ENDING DATE
                    NDTIME       1457  ENDING TIME
                     ICENT         19  CENTURY MARK

                COMPUTATION INTERVAL      .05 HOURS
                     TOTAL TIME BASE    14.95 HOURS

          ENGLISH UNITS
               DRAINAGE AREA          SQUARE MILES
               PRECIPITATION DEPTH    INCHES
               LENGTH, ELEVATION      FEET
               FLOW                   CUBIC FEET PER SECOND
               STORAGE VOLUME         ACRE-FEET
               SURFACE AREA           ACRES
               TEMPERATURE            DEGREES FAHRENHEIT

 14 JD          INDEX STORM NO. 1
                      STRM       1.60  PRECIPITATION DEPTH
                      TRDA        .01  TRANSPOSITION DRAINAGE AREA

 15 PI            PRECIPITATION PATTERN
                   1.20     1.54     2.22     1.26      .78     1.02     1.10     1.26     1.06      .96
                    .36      .24      .00      .00      .00      .00      .00      .00      .00      .00
                    .18      .26      .42      .22      .12      .36      .44      .60      .76      .84
                    .54      .54      .54      .46      .42      .12      .10      .06      .06      .06
                    .18      .32      .60      .80      .90      .72      .64      .48      .24      .12
                    .30      .48      .84      .60      .48      .18      .16      .12      .52      .72
                   1.62     1.68     1.80     2.88     3.42     5.40     5.42     5.46     6.62     7.20
                   2.04     2.10     2.22     1.98     1.86      .42      .60      .96      .96      .96
                    .30      .28      .24      .40      .48      .48      .56      .72     1.12     1.32
                    .96      .86      .66      .74      .78     1.20      .92      .36      .36      .36
                    .18      .16      .12      .12      .12      .06      .10      .18      .06      .00
                    .06      .06      .06      .14      .18      .00      .02      .06      .06      .06

 23 JD          INDEX STORM NO. 2
                      STRM       1.55  PRECIPITATION DEPTH
                      TRDA       1.00  TRANSPOSITION DRAINAGE AREA

  0 PI            PRECIPITATION PATTERN
                   1.20     1.54     2.22     1.26      .78     1.02     1.10     1.26     1.06      .96
                    .36      .24      .00      .00      .00      .00      .00      .00      .00      .00
                    .18      .26      .42      .22      .12      .36      .44      .60      .76      .84
                    .54      .54      .54      .46      .42      .12      .10      .06      .06      .06
                    .18      .32      .60      .80      .90      .72      .64      .48      .24      .12
                    .30      .48      .84      .60      .48      .18      .16      .12      .52      .72
                   1.62     1.68     1.80     2.88     3.42     5.40     5.42     5.46     6.62     7.20
                   2.04     2.10     2.22     1.98     1.86      .42      .60      .96      .96      .96
                    .30      .28      .24      .40      .48      .48      .56      .72     1.12     1.32
                    .96      .86      .66      .74      .78     1.20      .92      .36      .36      .36
                    .18      .16      .12      .12      .12      .06      .10      .18      .06      .00
                    .06      .06      .06      .14      .18      .00      .02      .06      .06      .06
```

24 JD INDEX STORM NO. 3

STRM	1.38	PRECIPITATION DEPTH
TRDA	9.99	TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

1.20	1.54	2.22	1.26	.78	1.02	1.10	1.26	1.06	.96
.36	.24	.00	.00	.00	.00	.00	.00	.00	.00
.18	.26	.42	.22	.12	.36	.44	.60	.76	.84
.54	.54	.54	.46	.42	.12	.10	.06	.06	.06
.18	.32	.60	.80	.90	.72	.64	.48	.24	.12
.30	.48	.84	.60	.48	.18	.16	.12	.52	.72
1.62	1.68	1.80	2.88	3.42	5.40	5.42	5.46	6.62	7.20
2.04	2.10	2.22	1.98	1.86	.42	.60	.96	.96	.96
.30	.28	.24	.40	.48	.48	.56	.72	1.12	1.32
.96	.86	.66	.74	.78	1.20	.92	.36	.36	.36
.18	.16	.12	.12	.12	.06	.10	.18	.06	.00
.06	.06	.06	.14	.18	.00	.02	.06	.06	.06

25 JD INDEX STORM NO. 4

STRM	1.38	PRECIPITATION DEPTH
TRDA	10.01	TRANSPOSITION DRAINAGE AREA

26 PI PRECIPITATION PATTERN

.60	.56	.48	.28	.18	.54	.40	.12	.24	.30
.18	.26	.42	.34	.30	.48	.52	.60	.60	.60
.66	.62	.54	.54	.54	.36	.54	.90	.70	.60
.60	.50	.30	.26	.24	.06	.18	.42	.30	.24
.36	.36	.36	.64	.78	.90	1.00	1.20	1.48	1.62
1.32	1.82	2.82	2.42	2.22	2.82	3.26	4.14	4.58	4.80
.60	.62	.66	1.06	1.26	1.62	1.30	.66	.42	.30
.54	.48	.36	.52	.60	.36	.52	.84	1.04	1.14
1.80	1.62	1.26	1.54	1.68	1.68	1.20	.24	.24	.24
.30	.24	.12	.12	.12	.12	.16	.24	.12	.06
.12	.10	.06	.14	.18	.06	.08	.12	.08	.06

34 JD INDEX STORM NO. 5

STRM	1.26	PRECIPITATION DEPTH
TRDA	20.00	TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

1.20	1.58	2.34	1.62	1.26	1.80	1.88	2.04	.92	.36
.60	.56	.48	.28	.18	.54	.40	.12	.24	.30
.18	.26	.42	.34	.30	.48	.52	.60	.60	.60
.66	.62	.54	.54	.54	.36	.54	.90	.70	.60
.60	.50	.30	.26	.24	.06	.18	.42	.30	.24
.36	.36	.36	.64	.78	.90	1.00	1.20	1.48	1.62
1.32	1.82	2.82	2.42	2.22	2.82	3.26	4.14	4.58	4.80
.60	.62	.66	1.06	1.26	1.62	1.30	.66	.42	.30
.54	.48	.36	.52	.60	.36	.52	.84	1.04	1.14
1.80	1.62	1.26	1.54	1.68	1.68	1.20	.24	.24	.24
.30	.24	.12	.12	.12	.12	.16	.24	.12	.06
.12	.10	.06	.14	.18	.06	.08	.12	.08	.06

35 JD INDEX STORM NO. 6

STRM	1.18	PRECIPITATION DEPTH
TRDA	30.00	TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

1.20	1.58	2.34	1.62	1.26	1.80	1.88	2.04	.92	.36
.60	.56	.48	.28	.18	.54	.40	.12	.24	.30
.18	.26	.42	.34	.30	.48	.52	.60	.60	.60
.66	.62	.54	.54	.54	.36	.54	.90	.70	.60
.60	.50	.30	.26	.24	.06	.18	.42	.30	.24
.36	.36	.36	.64	.78	.90	1.00	1.20	1.48	1.62
1.32	1.82	2.82	2.42	2.22	2.82	3.26	4.14	4.58	4.80
.60	.62	.66	1.06	1.26	1.62	1.30	.66	.42	.30
.54	.48	.36	.52	.60	.36	.52	.84	1.04	1.14
1.80	1.62	1.26	1.54	1.68	1.68	1.20	.24	.24	.24
.30	.24	.12	.12	.12	.12	.16	.24	.12	.06
.12	.10	.06	.14	.18	.06	.08	.12	.08	.06

36 JD INDEX STORM NO. 7

STRM	1.09	PRECIPITATION DEPTH
TRDA	50.00	TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

```
37 JD         INDEX STORM NO. 8
                  STRM        .96  PRECIPITATION DEPTH
                  TRDA     100.00  TRANSPOSITION DRAINAGE AREA

 0 PI            PRECIPITATION PATTERN
                  1.20      1.58      2.34      1.62      1.26      1.80      1.88      2.04       .92       .36
                   .60       .56       .48       .28       .18       .54       .40       .12       .24       .30
                   .18       .26       .42       .34       .30       .48       .52       .60       .60       .60
                   .66       .62       .54       .54       .54       .36       .54       .90       .70       .60
                   .60       .50       .30       .26       .24       .06       .18       .42       .30       .24
                   .36       .36       .36       .64       .78       .90      1.00      1.20      1.48      1.62
                  1.32      1.82      2.82      2.42      2.22      2.82      3.26      4.14      4.58      4.80
                   .60       .62       .66      1.06      1.26      1.62      1.30       .66       .42       .30
                   .54       .48       .36       .52       .60       .36       .52       .84      1.04      1.14
                  1.80      1.62      1.26      1.54      1.68      1.68      1.20       .24       .24       .24
                   .30       .24       .12       .12       .12       .12       .16       .24       .12       .06
                   .12       .10       .06       .14       .18       .06       .08       .12       .08       .06
```

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	MM1A	426.	3.75	70.	28.	28.	.90		
+	HYDROGRAPH AT	BW1	5241.	6.00	2989.	1289.	1289.	60.50		
+	HYDROGRAPH AT	BW2	2759.	4.35	1102.	445.	445.	20.80		
+	2 COMBINED AT	BW1&2	6018.	5.65	3425.	1462.	1462.	81.30		
+	2 COMBINED AT	BW APX	6014.	5.65	3441.	1469.	1469.	82.20		
+	HYDROGRAPH AT	MM1B	580.	3.95	120.	48.	48.	2.10		
+	HYDROGRAPH AT	MM2	477.	3.95	98.	39.	39.	1.40		
+	HYDROGRAPH AT	HP1A	423.	3.90	91.	37.	37.	.80		
+	ROUTED TO	RTCPA	401.	4.35	91.	37.	37.	.80		
+	HYDROGRAPH AT	HP1B	309.	4.00	66.	27.	27.	1.00		
+	HYDROGRAPH AT	HP2	365.	4.00	78.	32.	32.	1.20		
+	4 COMBINED AT	CPA1	1229.	4.05	298.	120.	120.	4.40		
+	HYDROGRAPH AT	HP3	624.	4.05	148.	59.	59.	1.70		
+	2 COMBINED AT	CPA2	1757.	4.05	423.	170.	170.	6.10		
+	HYDROGRAPH AT	HP4	984.	4.00	214.	86.	86.	3.30		
+	HYDROGRAPH AT	HP5	526.	3.75	85.	34.	34.	1.20		
+	HYDROGRAPH AT	HP6	711.	4.00	160.	64.	64.	2.20		
+	ROUTED TO	RTCPD	689.	4.30	160.	64.	64.	2.20		
+	HYDROGRAPH AT	HPFA	110.	3.80	19.	8.	8.	.30		
+	3 COMBINED AT	CPD	884.	4.15	246.	99.	99.	3.70		
+	ROUTED TO	RTCPE	868.	4.50	246.	99.	99.	3.70		
+	HYDROGRAPH AT	HPFB	476.	3.90	94.	38.	38.	1.60		
+	3 COMBINED AT	CPE	1819.	4.10	502.	202.	202.	8.60		
+	2 COMBINED AT	CPF	2396.	4.05	820.	330.	330.	14.70		
+	HYDROGRAPH AT	SC1	3498.	6.00	1988.	855.	855.	39.40		
+	HYDROGRAPH AT	SC2	427.	3.95	89.	36.	36.	1.50		

*** NORMAL END OF HEC-1 ***

```
*****************************************                    *****************************************
*                                       *                    *                                       *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)    *                    *   U.S. ARMY CORPS OF ENGINEERS        *
*           SEPTEMBER 1990              *                    *   HYDROLOGIC ENGINEERING CENTER       *
*            VERSION 4.0                *                    *          609 SECOND STREET            *
*                                       *                    *     DAVIS, CALIFORNIA 95616           *
* RUN DATE  01/29/1993  TIME  22:03:06  *                    *          (916) 756-1104               *
*                                       *                    *                                       *
*****************************************                    *****************************************


                         X     X  XXXXXXX   XXXXX         X
                         X     X  X        X     X       XX
                         X     X  X        X              X
                         XXXXXXX  XXXX     X       XXXXX  X
                         X     X  X        X              X
                         X     X  X        X     X        X
                         X     X  XXXXXXX   XXXXX        XXX


    THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

    THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
    THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
    NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
    DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
    KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

        1          ID   FLOOD ASSESSMENT FOR RWMS JOB #:51056        FILE: RWMSC.DAT
        2          ID   100-YEAR 6-HOUR STORM 2.43 INCHES
        3          ID   POINT RAINFALL VALUES FROM NOAA ATLAS 2 VOL VII
        4          ID   ADJUSTED RAINFALL PER CORRECTION FACTOR IN TABLE 501 OF
        5          ID   CLARK COUNTY HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL (CCRFCD, 1990)
        6          ID   DEPTH-AREA REDUCTION FACTORS FROM TABLE 502 IN CCRFCD, 1990
        7          ID   CURVE NUMBERS DETERMINED USING TABLE 602 IN CCRFCD, 1990
        8          ID   LAG TIMES DETERMINED USING METHOD IN SECITON 606.3 IN CCRFCD, 1990
        9          ID   DRAINAGE AREAS FROM 7.5 MINUTE AND 15 MINUTE QUADS
       10          ID   THIS MODEL ADDRESSES DRAINAGES THAT COULD IMPACT THE RWMS
                   *DIAGRAM
       11          IT       3       0       0     300
       12          IO       5
       13          IN       5
       14          JD    2.43     .01
                   * RAINFALL DISTRIBUTION FROM CLARK COUNTY MANUAL LESS THAN 10 SQ. MILES
       15          PC       0       2     5.7     7.0     8.7    10.8    12.4    13.0    13.0    13.0
       16          PC    13.0    13.0    13.0    13.3    14.0    14.2    14.8    15.8    17.2    18.1
       17          PC    19.0    19.7    19.9    20.0    20.1    20.4    21.4    22.9    24.1    24.9
       18          PC    25.1    25.6    27.0    27.8    28.1    28.3    29.5    32.2    35.2    40.9
       19          PC    49.9    59.0    71.0    74.4    78.1    81.2    81.9    83.5    85.1    85.6
       20          PC    86.0    86.8    87.6    88.8    91.0    92.6    93.7    95.0    97.0    97.6
       21          PC    98.2    98.5    98.7    98.9    99.0    99.3    99.3    99.4    99.5    99.8
       22          PC    99.8    99.9   100.0
       23          JD    2.36       1
       24          JD    2.09    9.99
                   * CHANGED RAINFALL DISTRIBUTION ABOVE 10 SQ. MILES PER CLARK COUNTY MANUAL
       25          JD    2.09   10.01
       26          PC       0     2.0     5.9     8.0    11.0    14.4    15.0    16.0    16.8    17.1
       27          PC    18.0    18.2    18.7    19.0    19.7    20.2    21.0    22.0    23.0    24.1
       28          PC    25.0    25.9    26.5    28.0    29.0    30.0    30.5    30.9    31.0    31.7
       29          PC    32.1    32.7    33.3    34.6    36.1    38.1    40.8    43.0    47.7    51.4
       30          PC    56.1    63.0    71.0    72.0    73.1    75.2    77.9    79.0    79.5    80.4
       31          PC    81.0    82.0    82.6    84.0    85.9    88.9    91.0    93.8    96.6    97.0
       32          PC    97.4    97.9    98.1    98.3    98.5    98.9    99.0    99.2    99.3    99.6
       33          PC    99.7    99.9   100.0
       34          JD    1.92      20
       35          JD    1.80      30
       36          JD    1.65      50
       37          JD    1.46     100

       38          KK    MM1A
       39          KM   Basin runoff calculation for Mass. Mountains 1A
       40          BA      .9
       41          LS              80
       42          UD     .31

       43          KK     BW1
       44          KM     Basin runoff calculation for Barren Wash 1
       45          BA    60.5
       46          LS              83
       47          UD     2.1
```

```
48        KK     BW2
49        KM     Basin runoff calculation for Barren Wash 2
50        BA    20.8
51        LS              80
52        UD       .9

53        KK    BW1&2
54        KM    Combined BW1 and BW2
55        HC        2

56        KK  BW APX
57        KM    Combine BW1,BW2, and MM1A (assume dischcarge of Barren Wash "active apex")
58        HC        2

59        KK     MM1B
60        KM     Basin runoff calulation for Mass. Mountains 1B
          *   Flow was not combined with BW APX because flow from this watershed

          *   will not directly impact RWMS wereas a channel migration at the apex
          *   could impact the RWMS
61        BA      2.1
62        LS              77
63        UD      .48

64        KK      MM2
65        KM     Basin runoff calculation for Mass. Mountains 2
66        BA      1.4
67        LS              79
68        UD      .47

69        KK     HP1A
70        KM     Basin runoff calculation for Half Pint Range 1A
71        BA       .8
72        LS              85
73        UD      .48

74        KK    RTCPA
75        KM    Route Flow from HP1A to CPA
76        RM        9      .43      .2

77        KK     HP1B
78        KM     Basin runoff calculation for Half Pint Range 1B
79        BA      1.0
80        LS              78
81        UD      .51

82        KK      HP2
83        KM     Basin runoff calculation for Half Pint Range 2
84        BA     1.2
85        LS              78
86        UD      .51

87        KK     CPA1
88        KM     Combine MM2, routed HP1A, HP1B, HP2
89        HC        4

90        KK      HP3
91        KM      (CPB) Basin runoff calculation for Half Pint Range 3

94        UD      .59

95        KK     CPA2
96        KM     Combine HP3 with flow from CPA1
97        HC        2

98        KK      HP4
99        KM      (CPC) Basin runoff calculation for Half Pint Range 4
100       BA      3.3
101       LS              79
```

```
116   KK    HPFA
117   KM     Basin runoff calculation for Half Pint Range FA
118   BA      .3
119   LS              77
120   UD      .33

121   KK     CPD
122   KM     Combine HP5, routed HP6, and HPFA
123   HC       3

124   KK   RTCPE
125   KM     Route flow from CPD to CPE
126   RM       8     .39      .2

127   KK    HPFB
128   KM     Basin runoff calculation for Half Pint Range FB
129   BA     1.6
130   LS              77
131   UD      .44

132   KK     CPE
133   KM    Combine HP4 (CPC) with routed flow from CPD, and HPFB
134   HC       3

135   KK     CPF
136   KM    Combine all flow at Concentration just below RWMS (Flow from CPA & CPE)
137   HC       2

138   KK     SC1
139   KM     Basin runoff calculation for Scarp Canyon 1
      * Concentration Pt of this watershed is the active apex of the Scarp Canyon Fan
140   BA    39.4
141   LS              82
142   UD     2.1

143   KK     SC2
144   KM     Basin runoff calculation for Scarp Canyon 2
145   BA     1.5
146   LS              77
147   UD      .48
148   ZZ
```

```
                SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE      (V) ROUTING         (--->) DIVERSION OR PUMP FLOW

  NO.      (.) CONNECTOR       (<---) RETURN OF DIVERTED OR PUMPED FLOW

   38         MM1A
                 .
                 .
   43            .         BW1
                 .           .
                 .           .
   48            .           .         BW2
                 .           .           .
                 .           .           .
   53            .       BW1&2............
                 .           .
                 .           .
   56       BW APX............
                 .
                 .
   59            .        MM1B
                 .           .
                 .           .
   64            .           .         MM2
                 .           .           .
                 .           .           .
   69            .           .           .        HP1A
                 .           .           .           V
                 .           .           .           V
   74            .           .           .       RTCPA
                 .           .           .           .
                 .           .           .           .
   77            .           .           .           .        HP1B
                 .           .           .           .           .
                 .           .           .           .           .
   82            .           .           .           .           .         HP2
                 .           .           .           .           .           .
                 .           .           .           .           .           .
   87            .           .        CPA1....................................
                 .           .           .
                 .           .           .
   90            .           .           .         HP3
                 .           .           .           .
                 .           .           .           .
   95            .           .        CPA2............
                 .           .           .
                 .           .           .
   98            .           .           .         HP4
                 .           .           .           .
                 .           .           .           .
  103            .           .           .           .         HP5
                 .           .           .           .           .
                 .           .           .           .           .
  108            .           .           .           .           .         HP6
                 .           .           .           .           .           V
                 .           .           .           .           .           V
  113            .           .           .           .           .       RTCPD
                 .           .           .           .           .           .
                 .           .           .           .           .           .
  116            .           .           .           .           .           .        HPFA
                 .           .           .           .           .           .           .
                 .           .           .           .           .           .           .
  121            .           .           .           .         CPD........................
                 .           .           .           .           V
                 .           .           .           .           V
  124            .           .           .           .       RTCPE
                 .           .           .           .           .
                 .           .           .           .           .
  127            .           .           .           .           .        HPFB
                 .           .           .           .           .           .
                 .           .           .           .           .           .
  132            .           .           .         CPE........................
                 .           .           .           .
                 .           .           .           .
  135            .           .         CPF............
                 .           .           .
                 .           .           .
  138            .           .           .         SC1
                 .           .           .           .
                 .           .           .           .
  143            .           .           .           .         SC2

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
```

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*           SEPTEMBER 1990              *
*             VERSION 4.0               *
*                                       *
* RUN DATE  01/29/1993  TIME  22:03:06  *
*                                       *
*****************************************
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```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*   HYDROLOGIC ENGINEERING CENTER       *
*         609 SECOND STREET             *
*      DAVIS, CALIFORNIA 95616          *
*          (916) 756-1104               *
*                                       *
*****************************************
```

```
FLOOD ASSESSMENT FOR RWMS JOB #:51056         FILE: RWMSC.DAT
100-YEAR 6-HOUR STORM 2.43 INCHES
POINT RAINFALL VALUES FROM NOAA ATLAS 2 VOL VII
ADJUSTED RAINFALL PER CORRECTION FACTOR IN TABLE 501 OF
CLARK COUNTY HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL (CCRFCD, 1990)
DEPTH-AREA REDUCTION FACTORS FROM TABLE 502 IN CCRFCD, 1990
CURVE NUMBERS DETERMINED USING TABLE 602 IN CCRFCD, 1990
LAG TIMES DETERMINED USING METHOD IN SECITON 606.3 IN CCRFCD, 1990
DRAINAGE AREAS FROM 7.5 MINUTE AND 15 MINUTE QUADS
THIS MODEL ADDRESSES DRAINAGES THAT COULD IMPACT THE RWMS

12 IO        OUTPUT CONTROL VARIABLES
                   IPRNT           5  PRINT CONTROL
                   IPLOT           0  PLOT CONTROL
                   QSCAL          0.  HYDROGRAPH PLOT SCALE

   IT        HYDROGRAPH TIME DATA
                    NMIN           3  MINUTES IN COMPUTATION INTERVAL
                   IDATE      1    0  STARTING DATE
                   ITIME        0000  STARTING TIME
                      NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                  NDDATE      1    0  ENDING DATE
                  NDTIME        1457  ENDING TIME
                   ICENT          19  CENTURY MARK

              COMPUTATION INTERVAL     .05 HOURS
                   TOTAL TIME BASE   14.95 HOURS

         ENGLISH UNITS
              DRAINAGE AREA          SQUARE MILES
              PRECIPITATION DEPTH    INCHES
              LENGTH, ELEVATION      FEET
              FLOW                   CUBIC FEET PER SECOND
              STORAGE VOLUME         ACRE-FEET
              SURFACE AREA           ACRES
              TEMPERATURE            DEGREES FAHRENHEIT

14 JD         INDEX STORM NO. 1
                    STRM        2.43  PRECIPITATION DEPTH
                    TRDA         .01  TRANSPOSITION DRAINAGE AREA

15 PI         PRECIPITATION PATTERN
```

1.20	1.54	2.22	1.26	.78	1.02	1.10	1.26	1.06	.96
.36	.24	.00	.00	.00	.00	.00	.00	.00	.00
.18	.26	.42	.22	.12	.36	.44	.60	.76	.84
.54	.54	.54	.46	.42	.12	.10	.06	.06	.06
.18	.32	.60	.80	.90	.72	.64	.48	.24	.12
.30	.48	.84	.60	.48	.18	.16	.12	.52	.72
1.62	1.68	1.80	2.88	3.42	5.40	5.42	5.46	6.62	7.20
2.04	2.10	2.22	1.98	1.86	.42	.60	.96	.96	.96
.30	.28	.24	.40	.48	.48	.56	.72	1.12	1.32
.96	.86	.66	.74	.78	1.20	.92	.36	.36	.36
.18	.16	.12	.12	.12	.06	.10	.18	.06	.00
.06	.06	.06	.14	.18	.00	.02	.06	.06	.06

```
23 JD         INDEX STORM NO. 2
                    STRM        2.36  PRECIPITATION DEPTH
                    TRDA        1.00  TRANSPOSITION DRAINAGE AREA

 0 PI         PRECIPITATION PATTERN
```

1.20	1.54	2.22	1.26	.78	1.02	1.10	1.26	1.06	.96
.36	.24	.00	.00	.00	.00	.00	.00	.00	.00
.18	.26	.42	.22	.12	.36	.44	.60	.76	.84
.54	.54	.54	.46	.42	.12	.10	.06	.06	.06
.18	.32	.60	.80	.90	.72	.64	.48	.24	.12
.30	.48	.84	.60	.48	.18	.16	.12	.52	.72
1.62	1.68	1.80	2.88	3.42	5.40	5.42	5.46	6.62	7.20
2.04	2.10	2.22	1.98	1.86	.42	.60	.96	.96	.96
.30	.28	.24	.40	.48	.48	.56	.72	1.12	1.32
.96	.86	.66	.74	.78	1.20	.92	.36	.36	.36
.18	.16	.12	.12	.12	.06	.10	.18	.06	.00
.06	.06	.06	.14	.18	.00	.02	.06	.06	.06

24 JD INDEX STORM NO. 3

STRM 2.09 PRECIPITATION DEPTH

TRDA 9.99 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

1.20	1.54	2.22	1.26	.78	1.02	1.10	1.26	1.06	.96
.36	.24	.00	.00	.00	.00	.00	.00	.00	.00
.18	.26	.42	.22	.12	.36	.44	.60	.76	.84
.54	.54	.54	.46	.42	.12	.10	.06	.06	.06
.18	.32	.60	.80	.90	.72	.64	.48	.24	.12
.30	.48	.84	.60	.48	.18	.16	.12	.52	.72
1.62	1.68	1.80	2.88	3.42	5.40	5.42	5.46	6.62	7.20
2.04	2.10	2.22	1.98	1.86	.42	.60	.96	.96	.96
.30	.28	.24	.40	.48	.48	.56	.72	1.12	1.32
.96	.86	.66	.74	.78	1.20	.92	.36	.36	.36
.18	.16	.12	.12	.12	.06	.10	.18	.06	.00
.06	.06	.06	.14	.18	.00	.02	.06	.06	.06

25 JD INDEX STORM NO. 4

STRM 2.09 PRECIPITATION DEPTH

TRDA 10.01 TRANSPOSITION DRAINAGE AREA

26 PI PRECIPITATION PATTERN

1.20	1.58	2.34	1.62	1.26	1.80	1.88	2.04	.92	.36
.60	.56	.48	.28	.18	.54	.40	.12	.24	.30
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.60	.50	.30	.26	.24	.06	.18	.42	.30	.24
.36	.36	.36	.64	.78	.90	1.00	1.20	1.48	1.62
1.32	1.82	2.82	2.42	2.22	2.82	3.26	4.14	4.58	4.80
.60	.62	.66	1.06	1.26	1.62	1.30	.66	.42	.30
.54	.48	.36	.52	.60	.36	.52	.84	1.04	1.14
1.80	1.62	1.26	1.54	1.68	1.68	1.20	.24	.24	.24
.30	.24	.12	.12	.12	.12	.16	.24	.12	.06
.12	.10	.06	.14	.18	.06	.08	.12	.08	.06

34 JD INDEX STORM NO. 5

STRM 1.92 PRECIPITATION DEPTH

TRDA 20.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

1.20	1.58	2.34	1.62	1.26	1.80	1.88	2.04	.92	.36
.60	.56	.48	.28	.18	.54	.40	.12	.24	.30
.18	.26	.42	.34	.30	.48	.52	.60	.60	.60
.66	.62	.54	.54	.54	.36	.54	.90	.70	.60
.60	.50	.30	.26	.24	.06	.18	.42	.30	.24
.36	.36	.36	.64	.78	.90	1.00	1.20	1.48	1.62
1.32	1.82	2.82	2.42	2.22	2.82	3.26	4.14	4.58	4.80
.60	.62	.66	1.06	1.26	1.62	1.30	.66	.42	.30
.54	.48	.36	.52	.60	.36	.52	.84	1.04	1.14
1.80	1.62	1.26	1.54	1.68	1.68	1.20	.24	.24	.24
.30	.24	.12	.12	.12	.12	.16	.24	.12	.06
.12	.10	.06	.14	.18	.06	.08	.12	.08	.06

35 JD INDEX STORM NO. 6

STRM 1.80 PRECIPITATION DEPTH

TRDA 30.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

1.20	1.58	2.34	1.62	1.26	1.80	1.88	2.04	.92	.36
.60	.56	.48	.28	.18	.54	.40	.12	.24	.30
.18	.26	.42	.34	.30	.48	.52	.60	.60	.60
.66	.62	.54	.54	.54	.36	.54	.90	.70	.60
.60	.50	.30	.26	.24	.06	.18	.42	.30	.24
.36	.36	.36	.64	.78	.90	1.00	1.20	1.48	1.62
1.32	1.82	2.82	2.42	2.22	2.82	3.26	4.14	4.58	4.80
.60	.62	.66	1.06	1.26	1.62	1.30	.66	.42	.30
.54	.48	.36	.52	.60	.36	.52	.84	1.04	1.14
1.80	1.62	1.26	1.54	1.68	1.68	1.20	.24	.24	.24
.30	.24	.12	.12	.12	.12	.16	.24	.12	.06
.12	.10	.06	.14	.18	.06	.08	.12	.08	.06

36 JD INDEX STORM NO. 7

STRM 1.65 PRECIPITATION DEPTH

TRDA 50.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

37 JD INDEX STORM NO. 8

STRM 1.46 PRECIPITATION DEPTH

TRDA 100.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

1.20	1.58	2.34	1.62	1.26	1.80	1.88	2.04	.92	.36
.60	.56	.48	.28	.18	.54	.40	.12	.24	.30
.18	.26	.42	.34	.30	.48	.52	.60	.60	.60
.66	.62	.54	.54	.54	.36	.54	.90	.70	.60
.60	.50	.30	.26	.24	.06	.18	.42	.30	.24
.36	.36	.36	.64	.78	.90	1.00	1.20	1.48	1.62
1.32	1.82	2.82	2.42	2.22	2.82	3.26	4.14	4.58	4.80
.60	.62	.66	1.06	1.26	1.62	1.30	.66	.42	.30
.54	.48	.36	.52	.60	.36	.52	.84	1.04	1.14
1.80	1.62	1.26	1.54	1.68	1.68	1.20	.24	.24	.24
.30	.24	.12	.12	.12	.12	.16	.24	.12	.06
.12	.10	.06	.14	.18	.06	.08	.12	.08	.06

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	MM1A	467.	3.75	77.	31.	31.	.90		
+	HYDROGRAPH AT	BW1	4883.	6.15	2699.	1141.	1141.	60.50		
+	HYDROGRAPH AT	BW2	2778.	4.40	1133.	456.	456.	20.80		
+	2 COMBINED AT	BW1&2	5498.	5.75	3049.	1282.	1282.	81.30		
+	2 COMBINED AT	BW APX	5488.	5.75	3060.	1287.	1287.	82.20		
+	HYDROGRAPH AT	MM1B	644.	4.00	136.	55.	55.	2.10		
+	HYDROGRAPH AT	MM2	526.	3.95	108.	44.	44.	1.40		
+	HYDROGRAPH AT	HP1A	444.	3.95	92.	37.	37.	.80		
+	ROUTED TO	RTCPA	420.	4.40	92.	37.	37.	.80		
+	HYDROGRAPH AT	HP1B	346.	4.00	75.	30.	30.	1.00		
+	HYDROGRAPH AT	HP2	407.	4.00	89.	36.	36.	1.20		
+	4 COMBINED AT	CPA1	1297.	4.05	317.	127.	127.	4.40		
+	HYDROGRAPH AT	HP3	661.	4.05	156.	63.	63.	1.70		
+	2 COMBINED AT	CPA2	1827.	4.10	442.	177.	177.	6.10		
+	HYDROGRAPH AT	HP4	1060.	4.00	233.	94.	94.	3.30		
+	HYDROGRAPH AT	HP5	582.	3.75	94.	38.	38.	1.20		
+	HYDROGRAPH AT	HP6	766.	4.05	174.	70.	70.	2.20		
+	ROUTED TO	RTCPD	741.	4.30	174.	70.	70.	2.20		
+	HYDROGRAPH AT	HPFA	125.	3.80	21.	9.	9.	.30		
+	3 COMBINED AT	CPD	945.	4.15	266.	107.	107.	3.70		
+	ROUTED TO	RTCPE	927.	4.55	266.	107.	107.	3.70		
+	HYDROGRAPH AT	HPFB	533.	3.95	107.	43.	43.	1.60		
+	3 COMBINED AT	CPE	1898.	4.10	537.	215.	215.	8.60		
+	2 COMBINED AT	CPF	2462.	4.05	854.	343.	343.	14.70		
+	HYDROGRAPH AT	SC1	3438.	6.15	1900.	804.	804.	39.40		
+	HYDROGRAPH AT	SC2	478.	4.00	101.	41.	41.	1.50		

*** NORMAL END OF HEC-1 ***

HEC-1 MODEL OUTPUT

FILENAME: RWMS10.OUT

(10-YEAR MODEL)

```
*****************************************                    *****************************************
*                                       *                    *                                       *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)    *                    *  U.S. ARMY CORPS OF ENGINEERS         *
*           SEPTEMBER 1990              *                    *  HYDROLOGIC ENGINEERING CENTER        *
*            VERSION 4.0                *                    *       609 SECOND STREET               *
*                                       *                    *     DAVIS, CALIFORNIA 95616           *
* RUN DATE  01/29/1993  TIME  22:05:10  *                    *        (916) 756-1104                 *
*                                       *                    *                                       *
*****************************************                    *****************************************
```

```
X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X                X
XXXXXXX  XXXX     X         XXXXX  X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX          XXX
```

```
THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM
```

```
  1          ID    FLOOD ASSESSMENT FOR RWMS JOB #:51056          FILE: RWMS10.DAT
  2          ID    10-YEAR 6-HOUR STORM 1.1 INCHES
  3          ID    POINT RAINFALL VALUE FROM NOAA ATLASS 2 VOL VII
  4          ID    DEPTH-AREA REDUCTION FACTORS FROM TABLE 502 IN
  5          ID    CLARK COUNTY HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL (CCRFCD, 1990)
  6          ID    CURVE NUMBERS DETERMINED USING TABLE 602 IN CCRFCD, 1990
  7          ID    LAG TIMES DETEMINED USING METHOD IN SECTION 606.3 IN CCRFCD, 1990
  8          ID    DRAINAGE AREAS FROM 7.5 MINUTE AND 15 MINUTE QUADS
  9          ID    THIS MODEL ADDRESSES DRAINAGES THAT COULD IMPACT THE RWMS
             *DIAGRAM
 10          IT        3       0       0     300
 11          IO        5
 12          IN        5
 13          JD      1.1     .01
             * RAINFALL DISTRIBUTION FROM CLARK COUNTY MANUAL LESS THAN 10 SQ. MILES
 14          PC        0       2     5.7     7.0     8.7    10.8    12.4    13.0    13.0    13.0
 15          PC     13.0    13.0    13.0    13.3    14.0    14.2    14.8    15.8    17.2    18.1
 16          PC     19.0    19.7    19.9    20.0    20.1    20.4    21.4    22.9    24.1    24.9
 17          PC     25.1    25.6    27.0    27.8    28.1    28.3    29.5    32.2    35.2    40.9
 18          PC     49.9    59.0    71.0    74.4    78.1    81.2    81.9    83.5    85.1    85.6
 19          PC     86.0    86.8    87.6    88.8    91.0    92.6    93.7    95.0    97.0    97.6
 20          PC     98.2    98.5    98.7    98.9    99.0    99.3    99.3    99.4    99.5    99.8
 21          PC     99.8    99.9   100.0
 22          JD     1.07       1
 23          JD      .95    9.99
             * CHANGED RAINFALL DISTRIBUTION ABOVE 10 SQ. MILES PER CLARK COUNTY MANUAL
 24          JD      .95   10.01
 25          PC        0     2.0     5.9     8.0    11.0    14.4    15.0    16.0    16.8    17.1
 26          PC     18.0    18.2    18.7    19.0    19.7    20.2    21.0    22.0    23.0    24.1
 27          PC     25.0    25.9    26.5    28.0    29.0    30.0    30.5    30.9    31.0    31.7
 28          PC     32.1    32.7    33.3    34.6    36.1    38.1    40.8    43.0    47.7    51.4
 29          PC     56.1    63.0    71.0    72.0    73.1    75.2    77.9    79.0    79.5    80.4
 30          PC     81.0    82.0    82.6    84.0    85.9    88.9    91.0    93.8    96.6    97.0
 31          PC     97.4    97.9    98.1    98.3    98.5    98.9    99.0    99.2    99.3    99.6
 32          PC     99.7    99.9   100.0
 33          JD      .87      20
 34          JD      .81      30
 35          JD      .75      50
 36          JD      .66     100

 37          KK     MM1A
 38          KM    Basin runoff calculation for Mass. Mountains 1A
 39          BA       .9
 40          LS               80
 41          UD      .31

 42          KK      BW1
 43          KM      Basin runoff calculation for Barren Wash 1
 44          BA     60.5
 45          LS               83
 46          UD      2.1
```

```
KK     BW2
KM     Basin runoff calculation for Barren Wash 2
BA    20.8
LS                 80
UD       .9

KK   BW1&2
KM   Combined BW1 and BW2
HC       2

KK  BW APX
KM   Combine BW1,BW2, and MM1A (assume dischcarge of Barren Wash "active apex")
HC       2

KK     MM1B
KM     Basin runoff calulation for Mass. Mountains 1B
*    Flow was not combined with BW APX because flow from this watershed
*    will not directly impact RWMS wereas a channel migration at the apex
*    could impact the RWMS
BA     2.1
LS                 77
UD      .48

KK     MM2
KM     Basin runoff calculation for Mass. Mountains 2
BA     1.4
LS                 79
UD      .47

KK     HP1A
KM     Basin runoff calculation for Half Pint Range 1A
BA       .8
LS                 85
UD      .48

KK   RTCPA
KM   Route Flow from HP1A to CPA
RM       9     .43       .2

KK     HP1B
KM     Basin runoff calculation for Half Pint Range 1B
BA     1.0
LS                 78
UD      .51

KK     HP2
KM     Basin runoff calculation for Half Pint Range 2
BA     1.2
LS                 78
UD      .51

KK     CPA1
KM     Combine MM2, routed HP1A, HP1B, HP2
HC       4

KK     HP3
KM     (CPB) Basin runoff calculation for Half Pint Range 3
BA     1.7
LS                 82
UD      .59

KK     CPA2
KM     Combine HP3 with flow from CPA1
HC       2

KK     HP4
KM     (CPC) Basin runoff calculation for Half Pint Range 4
BA     3.3
LS                 79
UD      .52

KK     HP5
KM     Basin runoff calculation for Half Pint Range 5
BA     1.2
LS                 79
UD       .3

KK     HP6
KM     Basin runoff calculation for Half Pint Range 6
BA     2.2
LS                 80
UD      .55

KK   RTCPD
KM     Route HP6 to CPD
RM       5     .27       .2
```

```
115    KK   HPFA
116    KM    Basin runoff calculation for Half Pint Range FA
117    BA     .3
118    LS              77
119    UD    .33
```

[redacted]

```
121    KM    Combine HP5, routed HP6, and HPFA
122    HC      3

123    KK   RTCPE
```

[redacted]

```
126    KK   HPFB
127    KM    Basin runoff calculation for Half Pint Range FB
128    BA    1.6
129    LS              77
130    UD    .44

131    KK    CPE
132    KM   Combine HP4 (CPC) with routed flow from CPD, and HPFB
133    HC      3

134    KK    CPF
135    KM   Combine all flow at Concentration just below RWMS (Flow from CPA & CPE)
136    HC      2

137    KK    SC1
138    KM    Basin runoff calculation for Scarp Canyon 1
       * Concentration Pt of this watershed is the active apex of the Scarp Canyon Fan
139    BA   39.4
140    LS              82
141    UD    2.1

142    KK    SC2
143    KM    Basin runoff calculation for Scarp Canyon 2
144    BA    1.5
145    LS              77
146    UD    .48
147    ZZ
```

```
                SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW
  NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW
    37       MM1A
                .
                .
    42          .         BW1
                .           .
                .           .
    47          .           .         BW2
                .           .           .
                .           .           .
    52          .       BW1&2............
                .           .
                .           .
    55     BW APX............
                .
                .
    58          .        MM1B
                .           .
                .           .
    63          .           .         MM2
                .           .           .
                .           .           .
    68          .           .           .        HP1A
                .           .           .           V
                .           .           .           V
    73          .           .           .       RTCPA
                .           .           .           .
                .           .           .           .
    76          .           .           .           .        HP1B
                .           .           .           .           .
                .           .           .           .           .
    81          .           .           .           .           .         HP2
                .           .           .           .           .           .
                .           .           .           .           .           .
    86          .           .        CPA1....................................
                .           .           .
                .           .           .
    89          .           .           .         HP3
                .           .           .           .
                .           .           .           .
    94          .           .        CPA2............
                .           .           .
                .           .           .
    97          .           .           .         HP4
                .           .           .           .
                .           .           .           .
   102          .           .           .           .         HP5
                .           .           .           .           .
                .           .           .           .           .
   107          .           .           .           .           .         HP6
                .           .           .           .           .           V
                .           .           .           .           .           V
   112          .           .           .           .           .       RTCPD
                .           .           .           .           .           .
                .           .           .           .           .           .
   115          .           .           .           .           .           .        HPFA
                .           .           .           .           .           .           .
                .           .           .           .           .           .           .
   120          .           .           .           .         CPD........................
                .           .           .           .           V
                .           .           .           .           V
   123          .           .           .           .       RTCPE
                .           .           .           .           .
                .           .           .           .           .
   126          .           .           .           .           .        HPFB
                .           .           .           .           .           .
                .           .           .           .           .           .
   131          .           .           .         CPE........................
                .           .           .           .
                .           .           .           .
   134          .           .         CPF............
                .           .           .
                .           .           .
   137          .           .           .         SC1
                .           .           .           .
                .           .           .           .
   142          .           .           .           .         SC2
(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
```

```
*********************************************
*                                           *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)       *
*            SEPTEMBER 1990                 *
*              VERSION 4.0                  *
*                                           *
*  RUN DATE  01/29/1993  TIME  22:05:10     *
*                                           *
*********************************************
```

```
*********************************************
*                                           *
*   U.S. ARMY CORPS OF ENGINEERS            *
*   HYDROLOGIC ENGINEERING CENTER           *
*          609 SECOND STREET                *
*      DAVIS, CALIFORNIA 95616              *
*           (916) 756-1104                  *
*                                           *
*********************************************
```

```
FLOOD ASSESSMENT FOR RWMS JOB #:51056         FILE: RWMS10.DAT
10-YEAR 6-HOUR STORM 1.1 INCHES
POINT RAINFALL VALUE FROM NOAA ATLASS 2 VOL VII
DEPTH-AREA REDUCTION FACTORS FROM TABLE 502 IN
CLARK COUNTY HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL (CCRFCD, 1990)
CURVE NUMBERS DETERMINED USING TABLE 602 IN CCRFCD, 1990
LAG TIMES DETEMINED USING METHOD IN SECTION 606.3 IN CCRFCD, 1990
DRAINAGE AREAS FROM 7.5 MINUTE AND 15 MINUTE QUADS
THIS MODEL ADDRESSES DRAINAGES THAT COULD IMPACT THE RWMS
```

```
11 IO        OUTPUT CONTROL VARIABLES
                   IPRNT          5  PRINT CONTROL
                   IPLOT          0  PLOT CONTROL
                   QSCAL         0.  HYDROGRAPH PLOT SCALE

  IT         HYDROGRAPH TIME DATA
                    NMIN          3  MINUTES IN COMPUTATION INTERVAL
                   IDATE      1   0  STARTING DATE
                   ITIME       0000  STARTING TIME
                      NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                  NDDATE      1   0  ENDING DATE
                  NDTIME       1457  ENDING TIME
                   ICENT         19  CENTURY MARK

              COMPUTATION INTERVAL      .05 HOURS
                   TOTAL TIME BASE    14.95 HOURS

        ENGLISH UNITS
            DRAINAGE AREA          SQUARE MILES
            PRECIPITATION DEPTH    INCHES
            LENGTH, ELEVATION      FEET
            FLOW                   CUBIC FEET PER SECOND
            STORAGE VOLUME         ACRE-FEET
            SURFACE AREA           ACRES
            TEMPERATURE            DEGREES FAHRENHEIT

13 JD         INDEX STORM NO. 1
                    STRM        1.10  PRECIPITATION DEPTH
                    TRDA         .01  TRANSPOSITION DRAINAGE AREA

14 PI          PRECIPITATION PATTERN
```

1.20	1.54	2.22	1.26	.78	1.02	1.10	1.26	1.06	.96
.36	.24	.00	.00	.00	.00	.00	.00	.00	.00
.18	.26	.42	.22	.12	.36	.44	.60	.76	.84
.54	.54	.54	.46	.42	.12	.10	.06	.06	.06
.18	.32	.60	.80	.90	.72	.64	.48	.24	.12
.30	.48	.84	.60	.48	.18	.16	.12	.52	.72
1.62	1.68	1.80	2.88	3.42	5.40	5.42	5.46	6.62	7.20
2.04	2.10	2.22	1.98	1.86	.42	.60	.96	.96	.96
.30	.28	.24	.40	.48	.48	.56	.72	1.12	1.32
.96	.86	.66	.74	.78	1.20	.92	.36	.36	.36
.18	.16	.12	.12	.12	.06	.10	.18	.06	.00
.06	.06	.06	.14	.18	.00	.02	.06	.06	.06

```
22 JD         INDEX STORM NO. 2
                    STRM        1.07  PRECIPITATION DEPTH
                    TRDA        1.00  TRANSPOSITION DRAINAGE AREA

 0 PI          PRECIPITATION PATTERN
```

1.20	1.54	2.22	1.26	.78	1.02	1.10	1.26	1.06	.96
.36	.24	.00	.00	.00	.00	.00	.00	.00	.00
.18	.26	.42	.22	.12	.36	.44	.60	.76	.84
.54	.54	.54	.46	.42	.12	.10	.06	.06	.06
.18	.32	.60	.80	.90	.72	.64	.48	.24	.12
.30	.48	.84	.60	.48	.18	.16	.12	.52	.72
1.62	1.68	1.80	2.88	3.42	5.40	5.42	5.46	6.62	7.20
2.04	2.10	2.22	1.98	1.86	.42	.60	.96	.96	.96
.30	.28	.24	.40	.48	.48	.56	.72	1.12	1.32
.96	.86	.66	.74	.78	1.20	.92	.36	.36	.36
.18	.16	.12	.12	.12	.06	.10	.18	.06	.00
.06	.06	.06	.14	.18	.00	.02	.06	.06	.06

23 JD INDEX STORM NO. 3

STRM .95 PRECIPITATION DEPTH

TRDA 9.99 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

1.20	1.54	2.22	1.26	.78	1.02	1.10	1.26	1.06	.96
.36	.24	.00	.00	.00	.00	.00	.00	.00	.00
.18	.26	.42	.22	.12	.36	.44	.60	.76	.84
.54	.54	.54	.46	.42	.12	.10	.06	.06	.06
.18	.32	.60	.80	.90	.72	.64	.48	.24	.12
.30	.48	.84	.60	.48	.18	.16	.12	.52	.72
1.62	1.68	1.80	2.88	3.42	5.40	5.42	5.46	6.62	7.20
2.04	2.10	2.22	1.98	1.86	.42	.60	.96	.96	.96
.30	.28	.24	.40	.48	.48	.56	.72	1.12	1.32
.96	.86	.66	.74	.78	1.20	.92	.36	.36	.36
.18	.16	.12	.12	.12	.06	.10	.18	.06	.00
.06	.06	.06	.14	.18	.00	.02	.06	.06	.06

24 JD INDEX STORM NO. 4

STRM .95 PRECIPITATION DEPTH

TRDA 10.01 TRANSPOSITION DRAINAGE AREA

25 PI PRECIPITATION PATTERN

1.20	1.58	2.34	1.62	1.26	1.80	1.88	2.04	.92	.36
.60	.56	.48	.28	.18	.54	.40	.12	.24	.30
.18	.26	.42	.34	.30	.48	.52	.60	.60	.60
.66	.62	.54	.54	.54	.36	.54	.90	.70	.60
.60	.50	.30	.26	.24	.06	.18	.42	.30	.24
.36	.36	.36	.64	.78	.90	1.00	1.20	1.48	1.62
1.32	1.82	2.82	2.42	2.22	2.82	3.26	4.14	4.58	4.80
.60	.62	.66	1.06	1.26	1.62	1.30	.66	.42	.30
.54	.48	.36	.52	.60	.36	.52	.84	1.04	1.14
1.80	1.62	1.26	1.54	1.68	1.68	1.20	.24	.24	.24
.30	.24	.12	.12	.12	.12	.16	.24	.12	.06
.12	.10	.06	.14	.18	.06	.08	.12	.08	.06

33 JD INDEX STORM NO. 5

STRM .87 PRECIPITATION DEPTH

TRDA 20.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

1.20	1.58	2.34	1.62	1.26	1.80	1.88	2.04	.92	.36
.60	.56	.48	.28	.18	.54	.40	.12	.24	.30
.18	.26	.42	.34	.30	.48	.52	.60	.60	.60
.66	.62	.54	.54	.54	.36	.54	.90	.70	.60
.60	.50	.30	.26	.24	.06	.18	.42	.30	.24
.36	.36	.36	.64	.78	.90	1.00	1.20	1.48	1.62
1.32	1.82	2.82	2.42	2.22	2.82	3.26	4.14	4.58	4.80
.60	.62	.66	1.06	1.26	1.62	1.30	.66	.42	.30
.54	.48	.36	.52	.60	.36	.52	.84	1.04	1.14
1.80	1.62	1.26	1.54	1.68	1.68	1.20	.24	.24	.24
.30	.24	.12	.12	.12	.12	.16	.24	.12	.06
.12	.10	.06	.14	.18	.06	.08	.12	.08	.06

34 JD INDEX STORM NO. 6

STRM .81 PRECIPITATION DEPTH

TRDA 30.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

1.20	1.58	2.34	1.62	1.26	1.80	1.88	2.04	.92	.36
.60	.56	.48	.28	.18	.54	.40	.12	.24	.30
.18	.26	.42	.34	.30	.48	.52	.60	.60	.60
.66	.62	.54	.54	.54	.36	.54	.90	.70	.60
.60	.50	.30	.26	.24	.06	.18	.42	.30	.24
.36	.36	.36	.64	.78	.90	1.00	1.20	1.48	1.62
1.32	1.82	2.82	2.42	2.22	2.82	3.26	4.14	4.58	4.80
.60	.62	.66	1.06	1.26	1.62	1.30	.66	.42	.30
.54	.48	.36	.52	.60	.36	.52	.84	1.04	1.14
1.80	1.62	1.26	1.54	1.68	1.68	1.20	.24	.24	.24
.30	.24	.12	.12	.12	.12	.16	.24	.12	.06
.12	.10	.06	.14	.18	.06	.08	.12	.08	.06

35 JD INDEX STORM NO. 7

STRM .75 PRECIPITATION DEPTH

TRDA 50.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

1.20	1.58	2.34	1.62	1.26	1.80	1.88	2.04	.92	.36
.60	.56	.48	.28	.18	.54	.40	.12	.24	.30
.18	.26	.42	.34	.30	.48	.52	.60	.60	.60
.66	.62	.54	.54	.54	.36	.54	.90	.70	.60
.60	.50	.30	.26	.24	.06	.18	.42	.30	.24
.36	.36	.36	.64	.78	.90	1.00	1.20	1.48	1.62
1.32	1.82	2.82	2.42	2.22	2.82	3.26	4.14	4.58	4.80
.60	.62	.66	1.06	1.26	1.62	1.30	.66	.42	.30
.54	.48	.36	.52	.60	.36	.52	.84	1.04	1.14
1.80	1.62	1.26	1.54	1.68	1.68	1.20	.24	.24	.24
.30	.24	.12	.12	.12	.12	.16	.24	.12	.06
.12	.10	.06	.14	.18	.06	.08	.12	.08	.06

36 JD INDEX STORM NO. 8

STRM .66 PRECIPITATION DEPTH

TRDA 100.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

1.20	1.58	2.34	1.62	1.26	1.80	1.88	2.04	.92	.36
.60	.56	.48	.28	.18	.54	.40	.12	.24	.30
.18	.26	.42	.34	.30	.48	.52	.60	.60	.60
.66	.62	.54	.54	.54	.36	.54	.90	.70	.60
.60	.50	.30	.26	.24	.06	.18	.42	.30	.24
.36	.36	.36	.64	.78	.90	1.00	1.20	1.48	1.62
1.32	1.82	2.82	2.42	2.22	2.82	3.26	4.14	4.58	4.80
.60	.62	.66	1.06	1.26	1.62	1.30	.66	.42	.30
.54	.48	.36	.52	.60	.36	.52	.84	1.04	1.14
1.80	1.62	1.26	1.54	1.68	1.68	1.20	.24	.24	.24
.30	.24	.12	.12	.12	.12	.16	.24	.12	.06
.12	.10	.06	.14	.18	.06	.08	.12	.08	.06

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	MM1A	50.	3.90	10.	4.	4.	.90		
+	HYDROGRAPH AT	BW1	511.	6.55	265.	111.	111.	60.50		
+	HYDROGRAPH AT	BW2	328.	5.50	104.	42.	42.	20.80		
+	2 COMBINED AT	BW1&2	510.	6.35	268.	112.	112.	81.30		
+	2 COMBINED AT	BW APX	452.	6.40	237.	99.	99.	82.20		
+	HYDROGRAPH AT	MM1B	43.	5.10	13.	5.	5.	2.10		
+	HYDROGRAPH AT	MM2	48.	4.10	13.	5.	5.	1.40		
+	HYDROGRAPH AT	HP1A	81.	4.00	18.	7.	7.	.80		
+	ROUTED TO	RTCPA	77.	4.45	18.	7.	7.	.80		
+	HYDROGRAPH AT	HP1B	28.	4.20	8.	3.	3.	1.00		
+	HYDROGRAPH AT	HP2	33.	4.20	10.	4.	4.	1.20		
+	4 COMBINED AT	CPA1	130.	4.35	39.	16.	16.	4.40		
+	HYDROGRAPH AT	HP3	87.	4.20	24.	10.	10.	1.70		
+	2 COMBINED AT	CPA2	187.	4.30	56.	22.	22.	6.10		
+	HYDROGRAPH AT	HP4	88.	4.20	26.	10.	10.	3.30		
+	HYDROGRAPH AT	HP5	54.	3.90	11.	5.	5.	1.20		
+	HYDROGRAPH AT	HP6	77.	4.20	22.	9.	9.	2.20		
+	ROUTED TO	RTCPD	75.	4.45	22.	9.	9.	2.20		
+	HYDROGRAPH AT	HPFA	9.	3.95	2.	1.	1.	.30		
+	3 COMBINED AT	CPD	90.	4.70	31.	12.	12.	3.70		
+	ROUTED TO	RTCPE	90.	5.05	31.	12.	12.	3.70		
+	HYDROGRAPH AT	HPFB	35.	5.05	10.	4.	4.	1.60		
+	3 COMBINED AT	CPE	168.	5.10	53.	21.	21.	8.60		
+	2 COMBINED AT	CPF	301.	5.20	84.	34.	34.	14.70		
+	HYDROGRAPH AT	SC1	356.	6.55	184.	78.	78.	39.40		
+	HYDROGRAPH AT	SC2	32.	5.10	10.	4.	4.	1.50		

*** NORMAL END OF HEC-1 ***

HEC-1 MODEL OUTPUT

FILENAME: RWMS10C.OUT

(10-YEAR MODEL)

```
*****************************************          *****************************************
*                                       *          *                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *          *   U.S. ARMY CORPS OF ENGINEERS        *
*            SEPTEMBER 1990             *          *   HYDROLOGIC ENGINEERING CENTER       *
*             VERSION 4.0               *          *         609 SECOND STREET             *
*                                       *          *      DAVIS, CALIFORNIA 95616          *
* RUN DATE  01/29/1993  TIME  22:06:45  *          *          (916) 756-1104               *
*                                       *          *                                       *
*****************************************          *****************************************


                    X     X  XXXXXXX   XXXXX           X
                    X     X  X        X     X         XX
                    X     X  X        X                X
                    XXXXXXX  XXXX     X         XXXXX  X
                    X     X  X        X                X
                    X     X  X        X     X          X
                    X     X  XXXXXXX   XXXXX          XXX


THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


   1          ID   FLOOD ASSESSMENT FOR RWMS JOB #:51056         FILE: RWMS10C.DAT
   2          ID   10-YEAR 6-HOUR STORM 1.1 INCHES
   3          ID   POINT RAINFALL VALUES FROM NOAA ATLAS 2 VOL VII
   4          ID   ADJUSTED RAINFALL PER CORRECTION FACTOR IN CLARK COUNTY MANUAL TABLE 501
   5          ID   DEPTH-AREA REDUCTION FACTORS FROM TABLE 502 IN
   6          ID   CLARK COUNTY HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL (CCRFCD, 1990)
   7          ID   CURVE NUMBERS DETERMINED USING TABLE 602 IN CCRFCD, 1990
   8          ID   LAG TIMES DETEMINED USING METHOD IN SECITON 606.3 IN CCRFCD, 1990
   9          ID   DRAINAGE AREAS FROM 7.5 MINUTE AND 15 MINUTE QUADS
  10          ID   THIS MODEL ADDRESSES DRAINAGES THAT COULD IMPACT THE RWMS
              *DIAGRAM
  11          IT        3         0         0       300
  12          IO        5
  13          IN        5
  14          JD     1.36       .01
              * RAINFALL DISTRIBUTION FROM CLARK COUNTY MANUAL LESS THAN 10 SQ. MILES
  15          PC        0        .2       5.7       7.0       8.7      10.8      12.4      13.0      13.0      13.0
  16          PC     13.0      13.0      13.0      13.3      14.0      14.2      14.8      15.8      17.2      18.1
  17          PC     19.0      19.7      19.9      20.0      20.1      20.4      21.4      22.9      24.1      24.9
  18          PC     25.1      25.6      27.0      27.8      28.1      28.3      29.5      32.2      35.2      40.9
  19          PC     49.9      59.0      71.0      74.4      78.1      81.2      81.9      83.5      85.1      85.6
  20          PC     86.0      86.8      87.6      88.8      91.0      92.6      93.7      95.0      97.0      97.6
  21          PC     98.2      98.5      98.7      98.9      99.0      99.3      99.3      99.4      99.5      99.8
  22          PC     99.8      99.9     100.0
  23          JD     1.32         1
  24          JD     1.17      9.99
              * CHANGED RAINFALL DISTRIBUTION ABOVE 10 SQ. MILES PER CLARK COUNTY MANUAL
  25          JD     1.17     10.01
  26          PC        0       2.0       5.9       8.0      11.0      14.4      15.0      16.0      16.8      17.1
  27          PC     18.0      18.2      18.7      19.0      19.7      20.2      21.0      22.0      23.0      24.1
  28          PC     25.0      25.9      26.5      28.0      29.0      30.0      30.5      30.9      31.0      31.7
  29          PC     32.1      32.7      33.3      34.6      36.1      38.1      40.8      43.0      47.7      51.4
  30          PC     56.1      63.0      71.0      72.0      73.1      75.2      77.9      79.0      79.5      80.4
  31          PC     81.0      82.0      82.6      84.0      85.9      88.9      91.0      93.8      96.6      97.0
  32          PC     97.4      97.9      98.1      98.3      98.5      98.9      99.0      99.2      99.3      99.6
  33          PC     99.7      99.9     100.0
  34          JD     1.07        20
  35          JD     1.01        30
  36          JD      .92        50
  37          JD      .82       100

  38          KK     MM1A
  39          KM   Basin runoff calculation for Mass. Mountains 1A
  40          BA       .9
  41          LS                 80
  42          UD      .31

  43          KK      BW1
  44          KM      Basin runoff calculation for Barren Wash 1
  45          BA     60.5
  46          LS                 83
  47          UD      2.1
```

```
KK     BW2
KM     Basin runoff calculation for Barren Wash 2
BA    20.8
LS                 80
UD       .9

KK    BW1&2
KM    Combined BW1 and BW2
HC        2

KK  BW APX
KM    Combine BW1,BW2, and MM1A (assume dischcarge of Barren Wash "active apex")
HC        2

KK     MM1B
KM      Basin runoff calulation for Mass. Mountains 1B
*   Flow was not combined with BW APX because flow from this watershed
*   will not directly impact RWMS wereas a channel migration at the apex
*   could impact the RWMS
BA      2.1
LS                 77
UD      .48

KK      MM2
KM      Basin runoff calculation for Mass. Mountains 2
BA      1.4
LS                 79
UD      .47

KK      HP1A
KM      Basin runoff calculation for Half Pint Range 1A
BA       .8
LS                 85
UD      .48

KK     RTCPA
KM     Route Flow from HP1A to CPA
RM        9      .43       .2

KK      HP1B
KM      Basin runoff calculation for Half Pint Range 1B
BA      1.0
LS                 78
UD      .51

KK      HP2
KM      Basin runoff calculation for Half Pint Range 2
BA      1.2
LS                 78
UD      .51

KK      CPA1
KM      Combine MM2, routed HP1A, HP1B, HP2
HC        4

KK       HP3
KM       (CPB) Basin runoff calculation for Half Pint Range 3
BA       1.7
LS                 82
UD       .59

KK      CPA2
KM      Combine HP3 with flow from CPA1
HC        2

KK       HP4
KM       (CPC) Basin runoff calculation for Half Pint Range 4
BA       3.3
LS                 79
UD       .52

KK       HP5
KM       Basin runoff calculation for Half Pint Range 5
BA       1.2
LS                 79
UD        .3

KK       HP6
KM       Basin runoff calculation for Half Pint Range 6
BA       2.2
LS                 80
UD       .55

KK     RTCPD
KM      Route HP6 to CPD
RM        5      .27       .2
```

```
KK    HPFA
KM     Basin runoff calculation for Half Pint Range FA
BA      .3
LS              77
UD     .33

KK     CPD
KM     Combine HP5, routed HP6, and HPFA
HC       3

KK   RTCPE
KM     Route flow from CPD to CPE
RM       8     .39      .2

KK     HPFB
KM     Basin runoff calculation for Half Pint Range FB
BA     1.6
LS              77
UD     .44

KK     CPE
KM    Combine HP4 (CPC) with routed flow from CPD, and HPFB
HC       3

KK     CPF
KM    Combine all flow at Concentration just below RWMS (Flow from CPA & CPE)
HC       2

KK     SC1
KM     Basin runoff calculation for Scarp Canyon 1
* Concentration Pt of this watershed is the active apex of the Scarp Canyon Fan
BA    39.4
LS              82
UD     2.1

KK     SC2
KM     Basin runoff calculation for Scarp Canyon 2
BA     1.5
LS              77
UD     .48
ZZ
```

```
                 SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
LINE       (V) ROUTING           (--->) DIVERSION OR PUMP FLOW
 NO.       (.) CONNECTOR         (<---) RETURN OF DIVERTED OR PUMPED FLOW
  38     MM1A
            .
            .
  43        .        BW1
            .          .
            .          .
  48        .          .         BW2
            .          .           .
            .          .           .
  53        .      BW1&2............
            .          .
            .          .
  56   BW APX...........
            .
            .
  59        .       MM1B
            .          .
            .          .
  64        .          .         MM2
            .          .           .
            .          .           .
  69        .          .           .        HP1A
            .          .           .           V
            .          .           .           V
  74        .          .           .       RTCPA
            .          .           .           .
            .          .           .           .
  77        .          .           .           .        HP1B
            .          .           .           .           .
            .          .           .           .           .
  82        .          .           .           .           .         HP2
            .          .           .           .           .           .
            .          .           .           .           .           .
  87        .          .        CPA1....................................
            .          .           .
            .          .           .
  90        .          .           .         HP3
            .          .           .           .
            .          .           .           .
  95        .          .        CPA2............
            .          .           .
            .          .           .
  98        .          .           .         HP4
            .          .           .           .
            .          .           .           .
 103        .          .           .           .         HP5
            .          .           .           .           .
            .          .           .           .           .
 108        .          .           .           .           .         HP6
            .          .           .           .           .           V
            .          .           .           .           .           V
 113        .          .           .           .           .       RTCPD
            .          .           .           .           .           .
            .          .           .           .           .           .
 116        .          .           .           .           .           .        HPFA
            .          .           .           .           .           .           .
            .          .           .           .           .           .           .
 121        .          .           .           .         CPD........................
            .          .           .           .           V
            .          .           .           .           V
 124        .          .           .           .       RTCPE
            .          .           .           .           .
            .          .           .           .           .
 127        .          .           .           .           .        HPFB
            .          .           .           .           .           .
            .          .           .           .           .           .
 132        .          .           .         CPE........................
            .          .           .           .
            .          .           .           .
 135        .          .         CPF............
            .          .           .
            .          .           .
 138        .          .           .         SC1
            .          .           .           .
            .          .           .           .
 143        .          .           .           .         SC2
(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
```

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*            SEPTEMBER 1990             *
*              VERSION 4.0              *
*                                       *
*  RUN DATE  01/29/1993  TIME  22:06:45 *
*                                       *
*****************************************

*****************************************
*                                       *
*     U.S. ARMY CORPS OF ENGINEERS      *
*     HYDROLOGIC ENGINEERING CENTER     *
*           609 SECOND STREET           *
*        DAVIS, CALIFORNIA 95616        *
*            (916) 756-1104             *
*                                       *
*****************************************
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```
                    FLOOD ASSESSMENT FOR RWMS JOB #:51056        FILE: RWMS10C.DAT
                    10-YEAR 6-HOUR STORM 1.1 INCHES
                    POINT RAINFALL VALUES FROM NOAA ATLAS 2 VOL VII
                    ADJUSTED RAINFALL PER CORRECTION FACTOR IN CLARK COUNTY MANUAL TABLE 501
                    DEPTH-AREA REDUCTION FACTORS FROM TABLE 502 IN
                    CLARK COUNTY HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL (CCRFCD, 1990)
                    CURVE NUMBERS DETERMINED USING TABLE 602 IN CCRFCD, 1990
                    LAG TIMES DETEMINED USING METHOD IN SECITON 606.3 IN CCRFCD, 1990
                    DRAINAGE AREAS FROM 7.5 MINUTE AND 15 MINUTE QUADS
                    THIS MODEL ADDRESSES DRAINAGES THAT COULD IMPACT THE RWMS

 12 IO          OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

    IT          HYDROGRAPH TIME DATA
                       NMIN          3  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1   0  STARTING DATE
                      ITIME       0000  STARTING TIME
                         NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      1   0  ENDING DATE
                     NDTIME       1457  ENDING TIME
                      ICENT         19  CENTURY MARK

                 COMPUTATION INTERVAL     .05 HOURS
                      TOTAL TIME BASE   14.95 HOURS

          ENGLISH UNITS
               DRAINAGE AREA          SQUARE MILES
               PRECIPITATION DEPTH    INCHES
               LENGTH, ELEVATION      FEET
               FLOW                   CUBIC FEET PER SECOND
               STORAGE VOLUME         ACRE-FEET
               SURFACE AREA           ACRES
               TEMPERATURE            DEGREES FAHRENHEIT

 14 JD          INDEX STORM NO. 1
                       STRM       1.36  PRECIPITATION DEPTH
                       TRDA        .01  TRANSPOSITION DRAINAGE AREA

 15 PI           PRECIPITATION PATTERN
                  1.20      1.54      2.22      1.26       .78      1.02      1.10      1.26      1.06       .96
                   .36       .24       .00       .00       .00       .00       .00       .00       .00       .00
                   .18       .26       .42       .22       .12       .36       .44       .60       .76       .84
                   .54       .54       .54       .46       .42       .12       .10       .06       .06       .06
                   .18       .32       .60       .80       .90       .72       .64       .48       .24       .12
                   .30       .48       .84       .60       .48       .18       .16       .12       .52       .72
                  1.62      1.68      1.80      2.88      3.42      5.40      5.42      5.46      6.62      7.20
                  2.04      2.10      2.22      1.98      1.86       .42       .60       .96       .96       .96
                   .30       .28       .24       .40       .48       .48       .56       .72      1.12      1.32
                   .96       .86       .66       .74       .78      1.20       .92       .36       .36       .36
                   .18       .16       .12       .12       .12       .06       .10       .18       .06       .00
                   .06       .06       .06       .14       .18       .00       .02       .06       .06       .06

 23 JD          INDEX STORM NO. 2
                       STRM       1.32  PRECIPITATION DEPTH
                       TRDA       1.00  TRANSPOSITION DRAINAGE AREA

  0 PI           PRECIPITATION PATTERN
                  1.20      1.54      2.22      1.26       .78      1.02      1.10      1.26      1.06       .96
                   .36       .24       .00       .00       .00       .00       .00       .00       .00       .00
                   .18       .26       .42       .22       .12       .36       .44       .60       .76       .84
                   .54       .54       .54       .46       .42       .12       .10       .06       .06       .06
                   .18       .32       .60       .80       .90       .72       .64       .48       .24       .12
                   .30       .48       .84       .60       .48       .18       .16       .12       .52       .72
                  1.62      1.68      1.80      2.88      3.42      5.40      5.42      5.46      6.62      7.20
                  2.04      2.10      2.22      1.98      1.86       .42       .60       .96       .96       .96
                   .30       .28       .24       .40       .48       .48       .56       .72      1.12      1.32
                   .96       .86       .66       .74       .78      1.20       .92       .36       .36       .36
                   .18       .16       .12       .12       .12       .06       .10       .18       .06       .00
                   .06       .06       .06       .14       .18       .00       .02       .06       .06       .06
```

24 JD INDEX STORM NO. 3

STRM 1.17 PRECIPITATION DEPTH

TRDA 9.99 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

1.20	1.54	2.22	1.26	.78	1.02	1.10	1.26	1.06	.96
.36	.24	.00	.00	.00	.00	.00	.00	.00	.00
.18	.26	.42	.22	.12	.36	.44	.60	.76	.84
.54	.54	.54	.46	.42	.12	.10	.06	.06	.06
.18	.32	.60	.80	.90	.72	.64	.48	.24	.12
.30	.48	.84	.60	.48	.18	.16	.12	.52	.72
1.62	1.68	1.80	2.88	3.42	5.40	5.42	5.46	6.62	7.20
2.04	2.10	2.22	1.98	1.86	.42	.60	.96	.96	.96
.30	.28	.24	.40	.48	.48	.56	.72	1.12	1.32
.96	.86	.66	.74	.78	1.20	.92	.36	.36	.36
.18	.16	.12	.12	.12	.06	.10	.18	.06	.00
.06	.06	.06	.14	.18	.00	.02	.06	.06	.06

25 JD INDEX STORM NO. 4

STRM 1.17 PRECIPITATION DEPTH

TRDA 10.01 TRANSPOSITION DRAINAGE AREA

26 PI PRECIPITATION PATTERN

1.20	1.58	2.34	1.62	1.26	1.80	1.88	2.04	.92	.36
.60	.56	.48	.28	.18	.54	.40	.12	.24	.30
.18	.26	.42	.34	.30	.48	.52	.60	.60	.60
.66	.62	.54	.54	.54	.36	.54	.90	.70	.60
.60	.50	.30	.26	.24	.06	.18	.42	.30	.24
.36	.36	.36	.64	.78	.90	1.00	1.20	1.48	1.62
1.32	1.82	2.82	2.42	2.22	2.82	3.26	4.14	4.58	4.80
.60	.62	.66	1.06	1.26	1.62	1.30	.66	.42	.30
.54	.48	.36	.52	.60	.36	.52	.84	1.04	1.14
1.80	1.62	1.26	1.54	1.68	1.68	1.20	.24	.24	.24
.30	.24	.12	.12	.12	.12	.16	.24	.12	.06
.12	.10	.06	.14	.18	.06	.08	.12	.08	.06

34 JD INDEX STORM NO. 5

STRM 1.07 PRECIPITATION DEPTH

TRDA 20.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

1.20	1.58	2.34	1.62	1.26	1.80	1.88	2.04	.92	.36
.60	.56	.48	.28	.18	.54	.40	.12	.24	.30
.18	.26	.42	.34	.30	.48	.52	.60	.60	.60
.66	.62	.54	.54	.54	.36	.54	.90	.70	.60
.60	.50	.30	.26	.24	.06	.18	.42	.30	.24
.36	.36	.36	.64	.78	.90	1.00	1.20	1.48	1.62
1.32	1.82	2.82	2.42	2.22	2.82	3.26	4.14	4.58	4.80
.60	.62	.66	1.06	1.26	1.62	1.30	.66	.42	.30
.54	.48	.36	.52	.60	.36	.52	.84	1.04	1.14
1.80	1.62	1.26	1.54	1.68	1.68	1.20	.24	.24	.24
.30	.24	.12	.12	.12	.12	.16	.24	.12	.06
.12	.10	.06	.14	.18	.06	.08	.12	.08	.06

35 JD INDEX STORM NO. 6

STRM 1.01 PRECIPITATION DEPTH

TRDA 30.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

1.20	1.58	2.34	1.62	1.26	1.80	1.88	2.04	.92	.36
.60	.56	.48	.28	.18	.54	.40	.12	.24	.30
.18	.26	.42	.34	.30	.48	.52	.60	.60	.60
.66	.62	.54	.54	.54	.36	.54	.90	.70	.60
.60	.50	.30	.26	.24	.06	.18	.42	.30	.24
.36	.36	.36	.64	.78	.90	1.00	1.20	1.48	1.62
1.32	1.82	2.82	2.42	2.22	2.82	3.26	4.14	4.58	4.80
.60	.62	.66	1.06	1.26	1.62	1.30	.66	.42	.30
.54	.48	.36	.52	.60	.36	.52	.84	1.04	1.14
1.80	1.62	1.26	1.54	1.68	1.68	1.20	.24	.24	.24
.30	.24	.12	.12	.12	.12	.16	.24	.12	.06
.12	.10	.06	.14	.18	.06	.08	.12	.08	.06

36 JD INDEX STORM NO. 7

STRM .92 PRECIPITATION DEPTH

TRDA 50.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

1.20	1.58	2.34	1.62	1.26	1.80	1.88	2.04	.92	.36
.60	.56	.48	.28	.18	.54	.40	.12	.24	.30
.18	.26	.42	.34	.30	.48	.52	.60	.60	.60
.66	.62	.54	.54	.54	.36	.54	.90	.70	.60
.60	.50	.30	.26	.24	.06	.18	.42	.30	.24
.36	.36	.36	.64	.78	.90	1.00	1.20	1.48	1.62
1.32	1.82	2.82	2.42	2.22	2.82	3.26	4.14	4.58	4.80
.60	.62	.66	1.06	1.26	1.62	1.30	.66	.42	.30
.54	.48	.36	.52	.60	.36	.52	.84	1.04	1.14
1.80	1.62	1.26	1.54	1.68	1.68	1.20	.24	.24	.24
.30	.24	.12	.12	.12	.12	.16	.24	.12	.06
.12	.10	.06	.14	.18	.06	.08	.12	.08	.06

37 JD INDEX STORM NO. 8

STRM .82 PRECIPITATION DEPTH

TRDA 100.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

1.20	1.58	2.34	1.62	1.26	1.80	1.88	2.04	.92	.36
.60	.56	.48	.28	.18	.54	.40	.12	.24	.30
.18	.26	.42	.34	.30	.48	.52	.60	.60	.60
.66	.62	.54	.54	.54	.36	.54	.90	.70	.60
.60	.50	.30	.26	.24	.06	.18	.42	.30	.24
.36	.36	.36	.64	.78	.90	1.00	1.20	1.48	1.62
1.32	1.82	2.82	2.42	2.22	2.82	3.26	4.14	4.58	4.80
.60	.62	.66	1.06	1.26	1.62	1.30	.66	.42	.30
.54	.48	.36	.52	.60	.36	.52	.84	1.04	1.14
1.80	1.62	1.26	1.54	1.68	1.68	1.20	.24	.24	.24
.30	.24	.12	.12	.12	.12	.16	.24	.12	.06
.12	.10	.06	.14	.18	.06	.08	.12	.08	.06

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	MM1A	108.	3.85	20.	8.	8.	.90		
+	HYDROGRAPH AT	BW1	1083.	6.40	574.	242.	242.	60.50		
+	HYDROGRAPH AT	BW2	653.	5.45	232.	93.	93.	20.80		
+	2 COMBINED AT	BW1&2	1083.	6.10	581.	244.	244.	81.30		
+	2 COMBINED AT	BW APX	1078.	6.10	581.	244.	244.	82.20		
+	HYDROGRAPH AT	MM1B	110.	4.10	28.	11.	11.	2.10		
+	HYDROGRAPH AT	MM2	110.	4.05	26.	10.	10.	1.40		
+	HYDROGRAPH AT	HP1A	139.	4.00	30.	12.	12.	.80		
+	ROUTED TO	RTCPA	132.	4.40	30.	12.	12.	.80		
+	HYDROGRAPH AT	HP1B	68.	4.10	17.	7.	7.	1.00		
+	HYDROGRAPH AT	HP2	79.	4.10	20.	8.	8.	1.20		
+	4 COMBINED AT	CPA1	278.	4.25	76.	31.	31.	4.40		
+	HYDROGRAPH AT	HP3	170.	4.15	43.	17.	17.	1.70		
+	2 COMBINED AT	CPA2	399.	4.20	108.	43.	43.	6.10		
+	HYDROGRAPH AT	HP4	210.	4.10	54.	21.	21.	3.30		
+	HYDROGRAPH AT	HP5	123.	3.85	23.	9.	9.	1.20		
+	HYDROGRAPH AT	HP6	168.	4.10	43.	17.	17.	2.20		
+	ROUTED TO	RTCPD	164.	4.40	43.	17.	17.	2.20		
+	HYDROGRAPH AT	HPFA	23.	3.90	5.	2.	2.	.30		
+	3 COMBINED AT	CPD	199.	4.30	62.	25.	25.	3.70		
+	ROUTED TO	RTCPE	196.	4.70	62.	25.	25.	3.70		
+	HYDROGRAPH AT	HPFB	93.	4.05	23.	9.	9.	1.60		
+	3 COMBINED AT	CPE	335.	4.25	116.	46.	46.	8.60		
+	2 COMBINED AT	CPF	576.	5.20	182.	73.	73.	14.70		
+	HYDROGRAPH AT	SC1	769.	6.40	408.	172.	172.	39.40		
+	HYDROGRAPH AT	SC2	84.	4.10	21.	9.	9.	1.50		

*** NORMAL END OF HEC-1 ***

HEC-1 MODEL OUTPUT

FILENAME: RWMS2.OUT

(2-YEAR MODEL)

```
*******************************************                    ******************************************
*                                         *                    *                                        *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)     *                    *   U.S. ARMY CORPS OF ENGINEERS         *
*            SEPTEMBER 1990               *                    *   HYDROLOGIC ENGINEERING CENTER        *
*             VERSION 4.0                 *                    *         609 SECOND STREET              *
*                                         *                    *      DAVIS, CALIFORNIA 95616           *
* RUN DATE  01/29/1993  TIME  22:08:57    *                    *         (916) 756-1104                 *
*                                         *                    *                                        *
*******************************************                    ******************************************
```

```
X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X                X
XXXXXXX  XXXX     X         XXXXX  X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX          XXX
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM
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```
  1      ID   FLOOD ASSESSMENT FOR RWMS JOB #:51056          FILE: RWMS2.DAT
  2      ID    2-YEAR 6-HOUR STORM 0.7 INCHES
  3      ID   POINT RAINFALL FROM NOAA ATLAS 2 VOL VII (NO ADJUSTMENT NECESSARY)
  4      ID   DEPTH-AREA REDUCTION FACTORS FROM TABLE 502 IN
  5      ID   CLARK COUNTY HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL (CCFRCD, 1990)
  6      ID   CURVE NUMBERS DETERMINED USING TABLE 602 IN CCFRCD, 1990
  7      ID   LAG TIMES DETERMINED USING METHOD IN SECTION 606.3 IN CCFRCD, 1990
  8      ID   DRAINAGE AREAS FROM 7.5 MINUTE AND 15 MINUTE QUADS
  9      ID   THIS MODEL ADDRESSES DRAINAGES THAT COULD IMPACT THE RWMS
         *DIAGRAM
 10      IT       3        0        0      300
 11      IO       5
 12      IN       5
 13      JD     0.7      .01
         * RAINFALL DISTRIBUTION FROM CLARK COUNTY MANUAL LESS THAN 10 SQ. MILES
 14      PC       0        2      5.7      7.0      8.7     10.8     12.4     13.0     13.0     13.0
 15      PC    13.0     13.0     13.0     13.3     14.0     14.2     14.8     15.8     17.2     18.1
 16      PC    19.0     19.7     19.9     20.0     20.1     20.4     21.4     22.9     24.1     24.9
 17      PC    25.1     25.6     27.0     27.8     28.1     28.3     29.5     32.2     35.2     40.9
 18      PC    49.9     59.0     71.0     74.4     78.1     81.2     81.9     83.5     85.1     85.6
 19      PC    86.0     86.8     87.6     88.8     91.0     92.6     93.7     95.0     97.0     97.6
 20      PC    98.2     98.5     98.7     98.9     99.0     99.3     99.3     99.4     99.5     99.8
 21      PC    99.8     99.9    100.0
 22      JD     .68        1
 23      JD     .60     9.99
         * CHANGED RAINFALL DISTRIBUTION ABOVE 10 SQ. MILES PER CLARK COUNTY MANUAL
 24      JD     .60    10.01
 25      PC       0      2.0      5.9      8.0     11.0     14.4     15.0     16.0     16.8     17.1
 26      PC    18.0     18.2     18.7     19.0     19.7     20.2     21.0     22.0     23.0     24.1
 27      PC    25.0     25.9     26.5     28.0     29.0     30.0     30.5     30.9     31.0     31.7
 28      PC    32.1     32.7     33.3     34.6     36.1     38.1     40.8     43.0     47.7     51.4
 29      PC    56.1     63.0     71.0     72.0     73.1     75.2     77.9     79.0     79.5     80.4
 30      PC    81.0     82.0     82.6     84.0     85.9     88.9     91.0     93.8     96.6     97.0
 31      PC    97.4     97.9     98.1     98.3     98.5     98.9     99.0     99.2     99.3     99.6
 32      PC    99.7     99.9    100.0
 33      JD     .55       20
 34      JD     .52       30
 35      JD     .48       50
 36      JD     .42      100

 37      KK    MM1A
 38      KM   Basin runoff calculation for Mass. Mountains 1A
 39      BA      .9
 40      LS                80
 41      UD     .31

 42      KK     BW1
 43      KM     Basin runoff calculation for Barren Wash 1
 44      BA    60.5
 45      LS                83
 46      UD     2.1
```

```
47        KK    BW2
48        KM    Basin runoff calculation for Barren Wash 2
49        BA   20.8
50        LS              80
51        UD      .9

52        KK   BW1&2
53        KM   Combined BW1 and BW2
54        HC      2

55        KK  BW APX
56        KM   Combine BW1,BW2, and MM1A (assume dischcarge of Barren Wash "active apex")
57        HC      2

58        KK    MM1B
59        KM    Basin runoff calulation for Mass. Mountains 1B
          *   Flow was not combined with BW APX because flow from this watershed
          *   will not directly impact RWMS wereas a channel migration at the apex
          *   could impact the RWMS
60        BA     2.1
61        LS              77
62        UD     .48

63        KK     MM2
64        KM    Basin runoff calculation for Mass. Mountains 2
65        BA     1.4
66        LS              79
67        UD     .47

68        KK    HP1A
69        KM    Basin runoff calculation for Half Pint Range 1A
70        BA      .8
71        LS              85
72        UD     .48

73        KK   RTCPA
74        KM   Route Flow from HP1A to CPA
75        RM      9      .43      .2

76        KK    HP1B
77        KM    Basin runoff calculation for Half Pint Range 1B
78        BA     1.0
79        LS              78
80        UD     .51

81        KK     HP2
82        KM    Basin runoff calculation for Half Pint Range 2
83        BA    1.2
84        LS              78
85        UD     .51

86        KK    CPA1
87        KM    Combine MM2, routed HP1A, HP1B, HP2
88        HC      4

89        KK     HP3
90        KM     (CPB) Basin runoff calculation for Half Pint Range 3
91        BA     1.7
92        LS              82
93        UD     .59

94        KK    CPA2
95        KM    Combine HP3 with flow from CPA1
96        HC      2

97        KK     HP4
98        KM     (CPC) Basin runoff calculation for Half Pint Range 4
99        BA     3.3
100       LS              79
101       UD     .52

102       KK     HP5
103       KM     Basin runoff calculation for Half Pint Range 5
104       BA     1.2
105       LS              79
106       UD      .3

107       KK     HP6
108       KM     Basin runoff calculation for Half Pint Range 6
109       BA     2.2
110       LS              80
111       UD     .55

112       KK   RTCPD
113       KM    Route HP6 to CPD
114       RM      5      .27      .2
```

```
KK   HPFA
KM    Basin runoff calculation for Half Pint Range FA
BA     .3
LS              77
UD    .33

KK    CPD
KM    Combine HP5, routed HP6, and HPFA
HC      3

KK  RTCPE
KM    Route flow from CPD to CPE
RM      8     .39      .2

KK    HPFB
KM    Basin runoff calculation for Half Pint Range FB
BA    1.6
LS              77
UD    .44

KK    CPE
KM   Combine HP4 (CPC) with routed flow from CPD, and HPFB
HC      3

KK    CPF
KM   Combine all flow at Concentration just below RWMS (Flow from CPA & CPE)
HC      2

KK    SC1
KM    Basin runoff calculation for Scarp Canyon 1
* Concentration Pt of this watershed is the active apex of the Scarp Canyon Fan
BA   39.4
LS              82
UD    2.1

KK    SC2
KM    Basin runoff calculation for Scarp Canyon 2
BA    1.5
LS              77
UD    .48
ZZ
```

```
                SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE    (V) ROUTING            (--->) DIVERSION OR PUMP FLOW

  NO.    (.) CONNECTOR          (<---) RETURN OF DIVERTED OR PUMPED FLOW

  37         MM1A
                .
  42            .          BW1
                .            .
  47            .            .          BW2
                .            .            .
  52            .        BW1&2............
                .            .
  55       BW APX.............
                .
  58            .         MM1B
                .            .
  63            .            .          MM2
                .            .            .
  68            .            .            .         HP1A
                .            .            .            V
                .            .            .            V
  73            .            .            .        RTCPA
                .            .            .            .
  76            .            .            .            .         HP1B
                .            .            .            .            .
  81            .            .            .            .            .          HP2
                .            .            .            .            .            .
  86            .            .         CPA1.....................................
                .            .            .
  89            .            .            .          HP3
                .            .            .            .
  94            .            .         CPA2............
                .            .            .
  97            .            .            .          HP4
                .            .            .            .
 102            .            .            .            .          HP5
                .            .            .            .            .
 107            .            .            .            .            .          HP6
                .            .            .            .            .            V
                .            .            .            .            .            V
 112            .            .            .            .            .        RTCPD
                .            .            .            .            .            .
 115            .            .            .            .            .            .         HPFA
                .            .            .            .            .            .            .
 120            .            .            .            .          CPD.........................
                .            .            .            .            V
                .            .            .            .            V
 123            .            .            .            .        RTCPE
                .            .            .            .            .
 126            .            .            .            .            .         HPFB
                .            .            .            .            .            .
 131            .            .            .          CPE.........................
                .            .            .            .
 134            .            .          CPF............
                .            .            .
 137            .            .            .          SC1
                .            .            .            .
 142            .            .            .            .          SC2

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
```

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*******************************************          ****************************************
*                                         *          *                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)     *          *   U.S. ARMY CORPS OF ENGINEERS       *
*            SEPTEMBER 1990               *          *   HYDROLOGIC ENGINEERING CENTER      *
*             VERSION 4.0                 *          *        609 SECOND STREET             *
*                                         *          *     DAVIS, CALIFORNIA 95616          *
*  RUN DATE  01/29/1993  TIME  22:08:57   *          *         (916) 756-1104               *
*                                         *          *                                      *
*******************************************          ****************************************
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```
                                   FLOOD ASSESSMENT FOR RWMS JOB #:51056        FILE: RWMS2.DAT
                                    2-YEAR 6-HOUR STORM 0.7 INCHES
                                   POINT RAINFALL FROM NOAA ATLAS 2 VOL VII (NO ADJUSTMENT NECESSARY)
                                   DEPTH-AREA REDUCTION FACTORS FROM TABLE 502 IN
                                   CLARK COUNTY HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL (CCFRCD, 1990)
                                   CURVE NUMBERS DETERMINED USING TABLE 602 IN CCFRCD, 1990
                                   LAG TIMES DETERMINED USING METHOD IN SECTION 606.3 IN CCFRCD, 1990
                                   DRAINAGE AREAS FROM 7.5 MINUTE AND 15 MINUTE QUADS
                                   THIS MODEL ADDRESSES DRAINAGES THAT COULD IMPACT THE RWMS

   11 IO          OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE

     IT           HYDROGRAPH TIME DATA
                         NMIN          3  MINUTES IN COMPUTATION INTERVAL
                        IDATE     1    0  STARTING DATE
                        ITIME       0000  STARTING TIME
                           NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE     1    0  ENDING DATE
                       NDTIME       1457  ENDING TIME
                        ICENT         19  CENTURY MARK

                   COMPUTATION INTERVAL     .05 HOURS
                        TOTAL TIME BASE   14.95 HOURS

           ENGLISH UNITS
                DRAINAGE AREA          SQUARE MILES
                PRECIPITATION DEPTH    INCHES
                LENGTH, ELEVATION      FEET
                FLOW                   CUBIC FEET PER SECOND
                STORAGE VOLUME         ACRE-FEET
                SURFACE AREA           ACRES
                TEMPERATURE            DEGREES FAHRENHEIT

   13 JD           INDEX STORM NO. 1
                         STRM        .70  PRECIPITATION DEPTH
                         TRDA        .01  TRANSPOSITION DRAINAGE AREA

   14 PI             PRECIPITATION PATTERN
                     1.20       1.54      2.22      1.26       .78      1.02      1.10      1.26      1.06       .96
                      .36        .24       .00       .00       .00       .00       .00       .00       .00       .00
                      .18        .26       .42       .22       .12       .36       .44       .60       .76       .84
                      .54        .54       .54       .46       .42       .12       .10       .06       .06       .06
                      .18        .32       .60       .80       .90       .72       .64       .48       .24       .12
                      .30        .48       .84       .60       .48       .18       .16       .12       .52       .72
                     1.62       1.68      1.80      2.88      3.42      5.40      5.42      5.46      6.62      7.20
                     2.04       2.10      2.22      1.98      1.86       .42       .60       .96       .96       .96
                      .30        .28       .24       .40       .48       .48       .56       .72      1.12      1.32
                      .96        .86       .66       .74       .78      1.20       .92       .36       .36       .36
                      .18        .16       .12       .12       .12       .06       .10       .18       .06       .00
                      .06        .06       .06       .14       .18       .00       .02       .06       .06       .06

   22 JD           INDEX STORM NO. 2
                         STRM        .68  PRECIPITATION DEPTH
                         TRDA       1.00  TRANSPOSITION DRAINAGE AREA

    0 PI             PRECIPITATION PATTERN
                     1.20       1.54      2.22      1.26       .78      1.02      1.10      1.26      1.06       .96
                      .36        .24       .00       .00       .00       .00       .00       .00       .00       .00
                      .18        .26       .42       .22       .12       .36       .44       .60       .76       .84
                      .54        .54       .54       .46       .42       .12       .10       .06       .06       .06
                      .18        .32       .60       .80       .90       .72       .64       .48       .24       .12
                      .30        .48       .84       .60       .48       .18       .16       .12       .52       .72
                     1.62       1.68      1.80      2.88      3.42      5.40      5.42      5.46      6.62      7.20
                     2.04       2.10      2.22      1.98      1.86       .42       .60       .96       .96       .96
                      .30        .28       .24       .40       .48       .48       .56       .72      1.12      1.32
                      .96        .86       .66       .74       .78      1.20       .92       .36       .36       .36
                      .18        .16       .12       .12       .12       .06       .10       .18       .06       .00
                      .06        .06       .06       .14       .18       .00       .02       .06       .06       .06
```

23 JD INDEX STORM NO. 3
STRM .60 PRECIPITATION DEPTH
TRDA 9.99 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

1.20	1.54	2.22	1.26	.78	1.02	1.10	1.26	1.06	.96
.36	.24	.00	.00	.00	.00	.00	.00	.00	.00
.18	.26	.42	.22	.12	.36	.44	.60	.76	.84
.54	.54	.54	.46	.42	.12	.10	.06	.06	.06
.18	.32	.60	.80	.90	.72	.64	.48	.24	.12
.30	.48	.84	.60	.48	.18	.16	.12	.52	.72
1.62	1.68	1.80	2.88	3.42	5.40	5.42	5.46	6.62	7.20
2.04	2.10	2.22	1.98	1.86	.42	.60	.96	.96	.96
.30	.28	.24	.40	.48	.48	.56	.72	1.12	1.32
.96	.86	.66	.74	.78	1.20	.92	.36	.36	.36
.18	.16	.12	.12	.12	.06	.10	.18	.06	.00
.06	.06	.06	.14	.18	.00	.02	.06	.06	.06

24 JD INDEX STORM NO. 4
STRM .60 PRECIPITATION DEPTH
TRDA 10.01 TRANSPOSITION DRAINAGE AREA

25 PI PRECIPITATION PATTERN

1.20	1.58	2.34	1.62	1.26	1.80	1.88	2.04	.92	.36
.60	.56	.48	.28	.18	.54	.40	.12	.24	.30
.18	.26	.42	.34	.30	.48	.52	.60	.60	.60
.66	.62	.54	.54	.54	.36	.54	.90	.70	.60
.60	.50	.30	.26	.24	.06	.18	.42	.30	.24
.36	.36	.36	.64	.78	.90	1.00	1.20	1.48	1.62
1.32	1.82	2.82	2.42	2.22	2.82	3.26	4.14	4.58	4.80
.60	.62	.66	1.06	1.26	1.62	1.30	.66	.42	.30
.54	.48	.36	.52	.60	.36	.52	.84	1.04	1.14
1.80	1.62	1.26	1.54	1.68	1.68	1.20	.24	.24	.24
.30	.24	.12	.12	.12	.12	.16	.24	.12	.06
.12	.10	.06	.14	.18	.06	.08	.12	.08	.06

33 JD INDEX STORM NO. 5
STRM .55 PRECIPITATION DEPTH
TRDA 20.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

1.20	1.58	2.34	1.62	1.26	1.80	1.88	2.04	.92	.36
.60	.56	.48	.28	.18	.54	.40	.12	.24	.30
.18	.26	.42	.34	.30	.48	.52	.60	.60	.60
.66	.62	.54	.54	.54	.36	.54	.90	.70	.60
.60	.50	.30	.26	.24	.06	.18	.42	.30	.24
.36	.36	.36	.64	.78	.90	1.00	1.20	1.48	1.62
1.32	1.82	2.82	2.42	2.22	2.82	3.26	4.14	4.58	4.80
.60	.62	.66	1.06	1.26	1.62	1.30	.66	.42	.30
.54	.48	.36	.52	.60	.36	.52	.84	1.04	1.14
1.80	1.62	1.26	1.54	1.68	1.68	1.20	.24	.24	.24
.30	.24	.12	.12	.12	.12	.16	.24	.12	.06
.12	.10	.06	.14	.18	.06	.08	.12	.08	.06

34 JD INDEX STORM NO. 6
STRM .52 PRECIPITATION DEPTH
TRDA 30.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

1.20	1.58	2.34	1.62	1.26	1.80	1.88	2.04	.92	.36
.60	.56	.48	.28	.18	.54	.40	.12	.24	.30
.18	.26	.42	.34	.30	.48	.52	.60	.60	.60
.66	.62	.54	.54	.54	.36	.54	.90	.70	.60
.60	.50	.30	.26	.24	.06	.18	.42	.30	.24
.36	.36	.36	.64	.78	.90	1.00	1.20	1.48	1.62
1.32	1.82	2.82	2.42	2.22	2.82	3.26	4.14	4.58	4.80
.60	.62	.66	1.06	1.26	1.62	1.30	.66	.42	.30
.54	.48	.36	.52	.60	.36	.52	.84	1.04	1.14
1.80	1.62	1.26	1.54	1.68	1.68	1.20	.24	.24	.24
.30	.24	.12	.12	.12	.12	.16	.24	.12	.06
.12	.10	.06	.14	.18	.06	.08	.12	.08	.06

35 JD INDEX STORM NO. 7
STRM .48 PRECIPITATION DEPTH
TRDA 50.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

1.20	1.58	2.34	1.62	1.26	1.80	1.88	2.04	.92	.36
.60	.56	.48	.28	.18	.54	.40	.12	.24	.30
.18	.26	.42	.34	.30	.48	.52	.60	.60	.60
.66	.62	.54	.54	.54	.36	.54	.90	.70	.60
.60	.50	.30	.26	.24	.06	.18	.42	.30	.24
.36	.36	.36	.64	.78	.90	1.00	1.20	1.48	1.62
1.32	1.82	2.82	2.42	2.22	2.82	3.26	4.14	4.58	4.80
.60	.62	.66	1.06	1.26	1.62	1.30	.66	.42	.30
.54	.48	.36	.52	.60	.36	.52	.84	1.04	1.14
1.80	1.62	1.26	1.54	1.68	1.68	1.20	.24	.24	.24
.30	.24	.12	.12	.12	.12	.16	.24	.12	.06
.12	.10	.06	.14	.18	.06	.08	.12	.08	.06

36 JD INDEX STORM NO. 8

STRM .42 PRECIPITATION DEPTH

TRDA 100.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

1.20	1.58	2.34	1.62	1.26	1.80	1.88	2.04	.92	.36
.60	.56	.48	.28	.18	.54	.40	.12	.24	.30
.18	.26	.42	.34	.30	.48	.52	.60	.60	.60
.66	.62	.54	.54	.54	.36	.54	.90	.70	.60
.60	.50	.30	.26	.24	.06	.18	.42	.30	.24
.36	.36	.36	.64	.78	.90	1.00	1.20	1.48	1.62
1.32	1.82	2.82	2.42	2.22	2.82	3.26	4.14	4.58	4.80
.60	.62	.66	1.06	1.26	1.62	1.30	.66	.42	.30
.54	.48	.36	.52	.60	.36	.52	.84	1.04	1.14
1.80	1.62	1.26	1.54	1.68	1.68	1.20	.24	.24	.24
.30	.24	.12	.12	.12	.12	.16	.24	.12	.06
.12	.10	.06	.14	.18	.06	.08	.12	.08	.06

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	MM1A	6.	5.00	1.	0.	0.	.90		
+	HYDROGRAPH AT	BW1	22.	7.10	11.	4.	4.	60.50		
+	HYDROGRAPH AT	BW2	7.	6.00	2.	1.	1.	20.80		
+	2 COMBINED AT	BW1&2	22.	7.10	11.	4.	4.	81.30		
+	2 COMBINED AT	BW APX	9.	7.10	4.	2.	2.	82.20		
+	HYDROGRAPH AT	MM1B	2.	5.30	0.	0.	0.	2.10		
+	HYDROGRAPH AT	MM2	5.	5.15	1.	0.	0.	1.40		
+	HYDROGRAPH AT	HP1A	16.	4.15	4.	2.	2.	.80		
+	ROUTED TO	RTCPA	15.	4.55	4.	2.	2.	.80		
+	HYDROGRAPH AT	HP1B	3.	5.25	0.	0.	0.	1.00		
+	HYDROGRAPH AT	HP2	3.	5.25	1.	0.	0.	1.20		
+	4 COMBINED AT	CPA1	15.	5.40	4.	2.	2.	4.40		
+	HYDROGRAPH AT	HP3	14.	5.20	4.	2.	2.	1.70		
+	2 COMBINED AT	CPA2	23.	5.30	6.	3.	3.	6.10		
+	HYDROGRAPH AT	HP4	8.	5.25	2.	1.	1.	3.30		
+	HYDROGRAPH AT	HP5	6.	5.00	1.	0.	0.	1.20		
+	HYDROGRAPH AT	HP6	10.	5.25	2.	1.	1.	2.20		
+	ROUTED TO	RTCPD	10.	5.50	2.	1.	1.	2.20		
+	HYDROGRAPH AT	HPFA	1.	5.10	0.	0.	0.	.30		
+	3 COMBINED AT	CPD	10.	5.40	2.	1.	1.	3.70		
+	ROUTED TO	RTCPE	9.	5.75	2.	1.	1.	3.70		
+	HYDROGRAPH AT	HPFB	2.	5.25	0.	0.	0.	1.60		
+	3 COMBINED AT	CPE	9.	5.55	2.	1.	1.	8.60		
+	2 COMBINED AT	CPF	25.	5.50	6.	3.	3.	14.70		
+	HYDROGRAPH AT	SC1	15.	7.10	7.	3.	3.	39.40		
+	HYDROGRAPH AT	SC2	2.	5.30	0.	0.	0.	1.50		

*** NORMAL END OF HEC-1 ***

4.2.2 Shallow Concentrated Flooding

Results of the HEC-2 analysis for the watercourses draining subbasins MM2 and HP1A&B estimated the 100-year flow depths at 2 feet. The southwest corner of the site is also located within the 100-year flood hazard of this drainage, and is designated as Zone AO; depth 2 feet (*Figure 11* and *Sheet 3*). Again, this portion of the RWMS is not used for disposal of waste and is not included in the RCRA Part B Permit Application for the Area 5 RWMS. Appendix C contains the output of the HEC-2 model, the workmap, and cross sections used to analyze this drainage.

4.2.3 Sheetflow

FEMA (1991) usually describes areas that experience sheetflow as Zone X (an area of flooding with depths less than 1 foot). Calculations to determine the average 100-year depths for sheetflow areas support this assertion. Calculated depths within the proposed RWMS boundary and the proposed HWSU were all less than 1 foot. These facilities are not in a 100-year flood hazard from flow draining from the Massachusetts Mountains/Halfpint Range. Appendix D contains the calculations used to estimate the depth of flow in sheetflow regions.

Several measures were taken to assure that this flood assessment would be as conservative as reasonable. Discharges were calculated using a "state-of-the-art" approach for this region (i.e., CCRFCD Manual). All flow barriers such as roads, structures and existing nonengineered dikes were ignored to assume that all flow could reach the RWMS. The entire area was assumed to be prone to flooding and was delineated as an area of equal risk because of the inability to distinguish channels from the available topographic maps.

A Zone X designation is somewhat misleading. Although FEMA requires flood protection only for areas listed as Zone AO, a flood hazard must still be recognized within a Zone X. The sheetflow region to the north of the RWMS contains channels which range in depth up to 3 feet. FEMA (1991) states that discharge in sheetflow regions must be spread equally over the entire surface area. To the north of the RWMS, this results in average flow depths of less than 1 foot, and thus the designation of Zone X. Field observations of channels within this region indicate that flows greater than 1 foot could occur in these channels during a 100-year flood. Any type of flood protection design criteria must address the potential of channelized flow for this area.

5.0 REFERENCES

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Clark County Regional Flood Control District, 1990. *Hydrologic Criteria and Drainage Design Manual*; Las Vegas, Nevada.

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APPENDIX B

FEMA FAN MODEL OUTPUT

BARREN WASH ALLUVIAL FAN
SCARP CANYON ALLUVIAL FAN
HALFPINT ALLUVIAL FAN

NOTE: Model Set 3 was used to delineate the flood hazard zones of these fans. See Section 3.4, *Hydrology Discussion*.

Barren Wash Alluvial Fan: Model Set 1

AVULSION FACTOR = 1.5000

FLOOD FREQUENCY CURVE DEFINED BY LEAST-SQUARES FIT OF DATA

RETURN INTERVAL (YEARS)	INPUT DISCHARGE (CFS)	BEST FIT DISCHARGE (CFS)
2	22	22
10	510	511
100	1848	1845

MEAN = 1.042752
STANDARD DEVIATION = 1.533850
SKEW = -1.2

SUMMARY OF DISCHARGES:

10-YEAR DISCHARGE = 511
50-YEAR DISCHARGE = 1440
100-YEAR DISCHARGE = 1845
500-YEAR DISCHARGE = 2633

STATISTICS AFTER TRANSFORMATION OF Y=LOG(Q) TO Z=1.6502+0.5415 LOG(Q)

MEAN OF Z = 2.214841
STANDARD DEVIATION = 0.830596
SKEW = -1.200000
TRANSFORMATION CONSTANT = 4.989660

SINGLE-CHANNEL REGION

ENERGY (FT)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	$44.6869\ Q^{0.5415}$	WIDTH (FT)
0.5	0.3	49	0.39939	0.77515	5458
1.5	1.0	756	0.06472	0.22080	1555

VELOCITY (FT/SEC)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	$44.6869\ Q^{0.5415}$	WIDTH (FT)
3.5	0.4	68	0.35475	0.72986	5139
4.5	0.6	238	0.18938	0.50031	3523
5.5	0.9	649	0.07853	0.25818	1818
6.5	1.3	1496	0.01847	0.07781	548

MULTIPLE-CHANNEL REGION

SLOPE = 0.0120000
N-VALUE = 0.0300000

ENERGY (FT)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	$44.6869\ Q^{0.5415}$	WIDTH (FT)
0.5	0.4	429	0.12044	0.35977	9627

VELOCITY (FT/SEC)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	$44.6869\ Q^{0.5415}$	WIDTH (FT)
3.5	0.5	1046	0.03859	0.14838	3970

Barren Wash Alluvial Fan: Model Set 2

AVULSION FACTOR = 1.5000

FLOOD FREQUENCY CURVE DEFINED BY LEAST-SQUARES FIT OF DATA

RETURN INTERVAL (YEARS)	INPUT DISCHARGE (CFS)	BEST FIT DISCHARGE (CFS)
2	22	22
10	510	508
100	3513	3523

MEAN = 1.220155
STANDARD DEVIATION = 1.237478
SKEW = -0.6

SUMMARY OF DISCHARGES:

10-YEAR DISCHARGE = 508
50-YEAR DISCHARGE = 2234
100-YEAR DISCHARGE = 3523
500-YEAR DISCHARGE = 8018

STATISTICS AFTER TRANSFORMATION OF Y=LOG(Q) TO Z=1.3608+0.7454 LOG(Q)

MEAN OF Z = 2.270321
STANDARD DEVIATION = 0.922428
SKEW = -0.600000
TRANSFORMATION CONSTANT = 5.221557

SINGLE-CHANNEL REGION

ENERGY (FT)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	$22.9512\ Q^{0.7454}$	WIDTH (FT)
0.5	0.3	49	0.38603	0.75342	5552
1.5	1.0	756	0.07282	0.27335	2014
2.5	1.7	2712	0.01575	0.08826	650

VELOCITY (FT/SEC)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	$22.9512\ Q^{0.7454}$	WIDTH (FT)
3.5	0.4	68	0.33839	0.70932	5227
4.5	0.6	238	0.17753	0.49364	3637
5.5	0.9	649	0.08326	0.30011	2211
6.5	1.3	1496	0.03427	0.16404	1209
7.5	1.7	3059	0.01310	0.07724	566

MULTIPLE-CHANNEL REGION

SLOPE = 0.0120000
N-VALUE = 0.0300000

ENERGY (FT)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	$22.9512\ Q^{0.7454}$	WIDTH (FT)
0.5	0.4	429	0.11715	0.37930	10621

VELOCITY (FT/SEC)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	$22.9512\ Q^{0.7454}$	WIDTH (FT)
3.5	0.5	1046	0.05069	0.21668	6067
4.5	0.8	2981	0.01367	0.07961	2218

Barren Wash Alluvial Fan: Model Set 3

AVULSION FACTOR = 1.5000

FLOOD FREQUENCY CURVE DEFINED BY LEAST-SQUARES FIT OF DATA

RETURN INTERVAL (YEARS)	INPUT DISCHARGE (CFS)	BEST FIT DISCHARGE (CFS)
2	22	22
10	510	511
100	6018	6011

MEAN = 1.323916
STANDARD DEVIATION = 1.089877
SKEW = -0.1

SUMMARY OF DISCHARGES:

10-YEAR DISCHARGE = 511
50-YEAR DISCHARGE = 3187
100-YEAR DISCHARGE = 6011
500-YEAR DISCHARGE = 21319

STATISTICS AFTER TRANSFORMATION OF Y=LOG(Q) TO Z=1.1038+0.9523 LOG(Q)

MEAN OF Z = 2.364550
STANDARD DEVIATION = 1.037845
SKEW = -0.100000
TRANSFORMATION CONSTANT = 5.498632

SINGLE-CHANNEL REGION

ENERGY (FT)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	$12.7010\ Q^{0.9523}$	WIDTH (FT)
0.5	0.3	49	0.37636	0.74376	5771
1.5	1.0	756	0.07741	0.31531	2447
2.5	1.7	2712	0.02368	0.15673	1203

VELOCITY (FT/SEC)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	$12.7010\ Q^{0.9523}$	WIDTH (FT)
3.5	0.4	68	0.32668	0.70074	5438
4.5	0.6	238	0.17183	0.50209	3896
5.5	0.9	649	0.08625	0.33928	2633
6.5	1.3	1496	0.04176	0.22110	1712
7.5	1.7	3059	0.02093	0.14484	1104
8.5	2.2	5719	0.01078	0.08963	639

MULTIPLE-CHANNEL REGION

SLOPE = 0.0120000
N-VALUE = 0.0300000

ENERGY (FT)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	$12.7010\,Q^{0.9523}$	WIDTH (FT)
0.5	0.4	429	0.11639	0.40412	11916

VELOCITY (FT/SEC)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	$12.7010\,Q^{0.9523}$	WIDTH (FT)
3.5	0.5	1046	0.05870	0.26939	7936
4.5	0.8	2981	0.02152	0.14740	4278

AVULSION FACTOR = 1.5000

FLOOD FREQUENCY CURVE DEFINED BY LEAST-SQUARES FIT OF DATA

RETURN INTERVAL (YEARS)	INPUT DISCHARGE (CFS)	BEST FIT DISCHARGE (CFS)
2	22	22
10	1083	1100
100	5498	5436

MEAN = 0.967763
STANDARD DEVIATION = 1.909410
SKEW = -1.2

SUMMARY OF DISCHARGES:

10-YEAR DISCHARGE = 1100
50-YEAR DISCHARGE = 3994
100-YEAR DISCHARGE = 5436
500-YEAR DISCHARGE = 8466

STATISTICS AFTER TRANSFORMATION OF Y=LOG(Q) TO Z=2.1296+0.4869 LOG(Q)

MEAN OF Z = 2.600766
STANDARD DEVIATION = 0.929608
SKEW = -1.200000
TRANSFORMATION CONSTANT = 6.163823

SINGLE-CHANNEL REGION

ENERGY (FT)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	134.7735 $Q^{0.4869}$	WIDTH (FT)
0.5	0.3	49	0.41930	0.84140	7319
1.5	1.0	756	0.13521	0.45395	3949
2.5	1.7	2712	0.03806	0.17863	1554

VELOCITY (FT/SEC)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	134.7735 $Q^{0.4869}$	WIDTH (FT)
3.5	0.4	68	0.38395	0.81578	7096
4.5	0.6	238	0.24947	0.66394	5775
5.5	0.9	649	0.14958	0.48573	4225
6.5	1.3	1496	0.07778	0.30563	2659
7.5	1.7	3059	0.03212	0.15540	1352

MULTIPLE-CHANNEL REGION

SLOPE = 0.0120000
N-VALUE = 0.0300000

ENERGY (FT)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	134.7735 Q^0.4869	WIDTH (FT)
0.5	0.4	429	0.18835	0.56624	18717

VELOCITY (FT/SEC)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	134.7735 Q^0.4869	WIDTH (FT)
3.5	0.5	1046	0.10475	0.38461	12713
4.5	0.8	2981	0.03340	0.16040	5302

FEMA FAN MODEL OUTPUT

SCARP CANYON ALLUVIAL FAN

(Model Sets 1, 2, 3 & 4)

Scarp Canyon Alluvial Fan: Model Set 1

AVULSION FACTOR = 1.5000

FLOOD FREQUENCY CURVE DEFINED BY LEAST-SQUARES FIT OF DATA

RETURN INTERVAL (YEARS)	INPUT DISCHARGE (CFS)	BEST FIT DISCHARGE (CFS)
2	15	15
10	356	351
100	1251	1265

MEAN = 0.878659
STANDARD DEVIATION = 1.533991
SKEW = -1.2

SUMMARY OF DISCHARGES:

10-YEAR DISCHARGE = 351
50-YEAR DISCHARGE = 987
100-YEAR DISCHARGE = 1265
500-YEAR DISCHARGE = 1805

STATISTICS AFTER TRANSFORMATION OF Y=LOG(Q) TO Z=1.5751+0.5415 LOG(Q)

MEAN OF Z = 2.050915
STANDARD DEVIATION = 0.830638
SKEW = -1.200000
TRANSFORMATION CONSTANT = 4.290921

SINGLE-CHANNEL REGION

ENERGY (FT)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	$37.5951\ Q^{0.5415}$	WIDTH (FT)
0.5	0.3	49	0.34883	0.72387	4383
1.5	1.0	756	0.03535	0.13698	829

VELOCITY (FT/SEC)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	$37.5951\ Q^{0.5415}$	WIDTH (FT)
3.5	0.4	68	0.30420	0.67202	4069
4.5	0.6	238	0.14528	0.41207	2495
5.5	0.9	649	0.04559	0.17003	1030

MULTIPLE-CHANNEL REGION

SLOPE = 0.0148000
N-VALUE = 0.0300000

ENERGY (FT)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	$37.5951\ Q^{0.5415}$	WIDTH (FT)
0.5	0.4	443	0.07886	0.25909	5962

VELOCITY (FT/SEC)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	$37.5951\ Q^{0.5415}$	WIDTH (FT)
3.5	0.4	805	0.03152	0.12353	2842

Scarp Canyon Alluvial Fan: Model Set 2

AVULSION FACTOR = 1.5000

FLOOD FREQUENCY CURVE DEFINED BY LEAST-SQUARES FIT OF DATA

RETURN INTERVAL (YEARS)	INPUT DISCHARGE (CFS)	BEST FIT DISCHARGE (CFS)
2	15	15
10	356	351
100	2178	2198

MEAN = 1.030262
STANDARD DEVIATION = 1.279943
SKEW = -0.7

SUMMARY OF DISCHARGES:

10-YEAR DISCHARGE = 351
50-YEAR DISCHARGE = 1443
100-YEAR DISCHARGE = 2198
500-YEAR DISCHARGE = 4604

STATISTICS AFTER TRANSFORMATION OF Y=LOG(Q) TO Z=1.3680+0.7081 LOG(Q)

MEAN OF Z = 2.097573
STANDARD DEVIATION = 0.906384
SKEW = -0.700000
TRANSFORMATION CONSTANT = 4.459600

SINGLE-CHANNEL REGION

ENERGY (FT)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	$23.3345\ Q^{0.7081}$	WIDTH (FT)
0.5	0.3	49	0.33492	0.70714	4450
1.5	1.0	756	0.04683	0.19857	1250

VELOCITY (FT/SEC)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	$23.3345\ Q^{0.7081}$	WIDTH (FT)
3.5	0.4	68	0.28883	0.65373	4114
4.5	0.6	238	0.14038	0.42021	2645
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

MULTIPLE-CHANNEL REGION

SLOPE = 0.0148000
N-VALUE = 0.0300000

ENERGY (FT)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	0.7081 23.3345 Q	WIDTH (FT)
0.5	0.4	443	0.08348	0.29635	7087

VELOCITY	DEPTH	DISCHARGE	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	23.3345 Q	WIDTH
3.5	0.4	805	0.04358	0.18942	4530

Scarp Canyon Alluvial Fan: Model Set 3

AVULSION FACTOR = 1.5000

FLOOD FREQUENCY CURVE DEFINED BY LEAST-SQUARES FIT OF DATA

RETURN INTERVAL (YEARS)	INPUT DISCHARGE (CFS)	BEST FIT DISCHARGE (CFS)
2	15	15
10	356	357
100	3498	3491

MEAN = 1.117872
STANDARD DEVIATION = 1.152607
SKEW = -0.3

SUMMARY OF DISCHARGES:

10-YEAR DISCHARGE = 357
50-YEAR DISCHARGE = 1976
100-YEAR DISCHARGE = 3491
500-YEAR DISCHARGE = 10458

STATISTICS AFTER TRANSFORMATION OF Y=LOG(Q) TO Z=1.2079+0.8628 LOG(Q)

MEAN OF Z = 2.172367
STANDARD DEVIATION = 0.994433
SKEW = -0.300000
TRANSFORMATION CONSTANT = 4.652288

SINGLE-CHANNEL REGION

ENERGY	DEPTH	DISCHARGE	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	16.1400 Q	WIDTH
0.5	0.3	49	0.32531	0.70098	4602
1.5	1.0	756	0.05446	0.24845	1631
2.5	1.7	2712	0.01444	0.09633	625

LOCITY T/SEC)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: 0.8628 Q	16.1400 Q	WIDTH (FT)
3.5	0.4	68	0.27964	0.64926	4263
4.5	0.6	238	0.13909	0.43758	2873
5.5	0.9	649	0.06377	0.27117	1780
6.5	1.3	1496	0.02760	0.16044	1051
7.5	1.7	3059	0.01232	0.08785	565

MULTIPLE-CHANNEL REGION

SLOPE = 0.0148000
N-VALUE = 0.0300000

ENERGY (FT)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	$16.1400\ Q^{0.8628}$	WIDTH (FT)
0.5	0.4	443	0.08692	0.33143	8269

VELOCITY (FT/SEC)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	$16.1400\ Q^{0.8628}$	WIDTH (FT)
3.5	0.4	805	0.05067	0.23920	5968
4.5	0.6	2293	0.01738	0.11285	2774

Scarp Canyon Alluvial Fan: Model Set 4

AVULSION FACTOR = 1.5000

FLOOD FREQUENCY CURVE DEFINED BY LEAST-SQUARES FIT OF DATA

RETURN INTERVAL (YEARS)	INPUT DISCHARGE (CFS)	BEST FIT DISCHARGE (CFS)
2	15	15
10	769	779
100	3438	3406

MEAN = 0.751408
STANDARD DEVIATION = 2.011177
SKEW = -1.3

SUMMARY OF DISCHARGES:

10-YEAR DISCHARGE = 779
50-YEAR DISCHARGE = 2597
100-YEAR DISCHARGE = 3406
500-YEAR DISCHARGE = 4925

STATISTICS AFTER TRANSFORMATION OF Y=LOG(Q) TO Z=2.0997+0.4540 LOG(Q)

MEAN OF Z = 2.440823
STANDARD DEVIATION = 0.913058
SKEW = -1.300000
TRANSFORMATION CONSTANT = 5.305945

SINGLE-CHANNEL REGION

ENERGY (FT)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	$125.8027\ Q^{0.4540}$	WIDTH (FT)
0.5	0.3	49	0.38263	0.81739	6120
1.5	1.0	756	0.10286	0.37538	2811
2.5	1.7	2712	0.01841	0.09197	689

VELOCITY (FT/SEC)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	$125.8027\ Q^{0.4540}$	WIDTH (FT)
3.5	0.4	68	0.34751	0.78692	5892
4.5	0.6	238	0.21491	0.61188	4582
5.5	0.9	649	0.11751	0.41056	3074
6.5	1.3	1496	0.05029	0.21689	1624
7.5	1.7	3059	0.01396	0.07173	537

MULTIPLE-CHANNEL REGION

SLOPE = 0.0148000
N-VALUE = 0.0300000

ENERGY (FT)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: 0.4540 Q	125.8027 Q	WIDTH (FT)
0.5	0.4	443	0.15397	0.49326	14035

PROBABILITY OF DISCHARGE
BEING EXCEEDED AT THE

(FT/SEC)	(FT)	(CFS)	0.4540 Q	125.8027 Q	(FT)
3.5	0.4	805	0.09752	0.36091	10269
4.5	0.6	2293	0.02578	0.12522	3563

Halfpint Alluvial Fan: Model Set 1

AVULSION FACTOR = 1.5000

FLOOD FREQUENCY CURVE DEFINED BY LEAST-SQUARES FIT OF DATA

RETURN INTERVAL (YEARS)	INPUT DISCHARGE (CFS)	BEST FIT DISCHARGE (CFS)
2	10	10
10	168	170
100	603	598

MEAN = 0.759609
STANDARD DEVIATION = 1.328618
SKEW = -1.1

SUMMARY OF DISCHARGES:

10-YEAR DISCHARGE = 170
50-YEAR DISCHARGE = 464
100-YEAR DISCHARGE = 598
500-YEAR DISCHARGE = 876

STATISTICS AFTER TRANSFORMATION OF Y=LOG(Q) TO Z=1.2765+0.5980 LOG(Q)

MEAN OF Z = 1.730742
STANDARD DEVIATION = 0.794495
SKEW = -1.100000
TRANSFORMATION CONSTANT = 3.392134

SINGLE-CHANNEL REGION

ENERGY (FT)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	$18.9020\ Q^{0.5980}$	WIDTH (FT)
0.5	0.3	49	0.26742	0.59475	2847

VELOCITY (FT/SEC)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	$18.9020\ Q^{0.5980}$	WIDTH (FT)
3.5	0.4	68	0.21876	0.52204	2499
4.5	0.6	238	0.06832	0.21587	1033

MULTIPLE-CHANNEL REGION

SLOPE = 0.0196000
N-VALUE = 0.0300000

ENERGY (FT)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY:		WIDTH (FT)
				0.5980	
			Q	18.9020 Q	
0.5	0.3	449	0.02168	0.08480	1543

VELOCITY (FT/SEC)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY:		WIDTH (FT)
				0.5980	
			Q	18.9020 Q	
3.5	0.4	566	0.01212	0.04847	882

Halfpint Alluvial Fan: Model Set 2

AVULSION FACTOR = 1.5000

FLOOD FREQUENCY CURVE DEFINED BY LEAST-SQUARES FIT OF DATA

RETURN INTERVAL (YEARS)	INPUT DISCHARGE (CFS)	BEST FIT DISCHARGE (CFS)
2	10	10
10	168	169
100	1180	1176

MEAN = 0.928731
STANDARD DEVIATION = 1.055311
SKEW = -0.4

SUMMARY OF DISCHARGES:

10-YEAR DISCHARGE = 169
50-YEAR DISCHARGE = 731
100-YEAR DISCHARGE = 1176
500-YEAR DISCHARGE = 2890

STATISTICS AFTER TRANSFORMATION OF Y=LOG(Q) TO Z=1.0090+0.8374 LOG(Q)

MEAN OF Z = 1.786716
STANDARD DEVIATION = 0.883714
SKEW = -0.400000
TRANSFORMATION CONSTANT = 3.569505

SINGLE-CHANNEL REGION

ENERGY (FT)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	$10.2094\ Q^{0.8374}$	WIDTH (FT)
0.5	0.3	49	0.24808	0.57142	2878
1.5	1.0	756	0.01928	0.09924	500

VELOCITY (FT/SEC)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	$10.2094\ Q^{0.8374}$	WIDTH (FT)
3.5	0.4	68	0.20017	0.50667	2552
4.5	0.6	238	0.07596	0.26560	1338
5.5	0.9	649	0.02353	0.11884	599

MULTIPLE-CHANNEL REGION

SLOPE = 0.0196000
N-VALUE = 0.0300000

ENERGY (FT)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	$10.2094\ Q^{0.8374}$	WIDTH (FT)
0.5	0.3	449	0.03741	0.16695	3196

VELOCITY (FT/SEC)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	$10.2094\ Q^{0.8374}$	WIDTH (FT)
3.5	0.4	566	0.02835	0.13656	2614

Halfpint Alluvial Fan: Model Set 3

AVULSION FACTOR = 1.5000

FLOOD FREQUENCY CURVE DEFINED BY LEAST-SQUARES FIT OF DATA

RETURN INTERVAL (YEARS)	INPUT DISCHARGE (CFS)	BEST FIT DISCHARGE (CFS)
2	10	10
10	168	168
100	1819	1821

MEAN = 1.016033
STANDARD DEVIATION = 0.935309
SKEW = 0.1

SUMMARY OF DISCHARGES:

10-YEAR DISCHARGE = 168
50-YEAR DISCHARGE = 970
100-YEAR DISCHARGE = 1821
500-YEAR DISCHARGE = 6634

STATISTICS AFTER TRANSFORMATION OF Y=LOG(Q) TO Z=0.7953+1.0450 LOG(Q)

MEAN OF Z = 1.857036
STANDARD DEVIATION = 0.977359
SKEW = 0.100000
TRANSFORMATION CONSTANT = 3.728261

SINGLE-CHANNEL REGION

ENERGY (FT)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	$6.2420\,Q^{1.0450}$	WIDTH (FT)
0.5	0.3	49	0.23709	0.56316	2963
1.5	1.0	756	0.02605	0.15414	802

VELOCITY (FT/SEC)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	$6.2420\,Q^{1.0450}$	WIDTH (FT)
3.5	0.4	68	0.19242	0.50416	2653
4.5	0.6	238	0.07866	0.29407	1546
5.5	0.9	649	0.03085	0.16909	883
6.5	1.3	1496	0.01313	0.09258	462

MULTIPLE-CHANNEL REGION

SLOPE = 0.0196000
N-VALUE = 0.0300000

ENERGY (FT)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	$6.2420\ Q^{1.0450}$	WIDTH (FT)
0.5	0.3	449	0.04315	0.20703	4126

VELOCITY (FT/SEC)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	$6.2420\ Q^{1.0450}$	WIDTH (FT)
3.5	0.4	566	0.03509	0.18232	3625
4.5	0.5	1614	0.01192	0.08813	1651

AVULSION FACTOR = 1.5000

FLOOD FREQUENCY CURVE DEFINED BY LEAST-SQUARES FIT OF DATA

RETURN INTERVAL (YEARS)	INPUT DISCHARGE (CFS)	BEST FIT DISCHARGE (CFS)
2	10	10
10	335	343
100	1898	1867

MEAN = 0.734788
STANDARD DEVIATION = 1.596884
SKEW = -1.0

SUMMARY OF DISCHARGES:

10-YEAR DISCHARGE = 343
50-YEAR DISCHARGE = 1310
100-YEAR DISCHARGE = 1867
500-YEAR DISCHARGE = 3269

STATISTICS AFTER TRANSFORMATION OF Y=LOG(Q) TO Z=1.6637+0.5765 LOG(Q)

MEAN OF Z = 2.087308
STANDARD DEVIATION = 0.920624
SKEW = -1.000000
TRANSFORMATION CONSTANT = 4.101043

SINGLE-CHANNEL REGION

ENERGY (FT)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	$46.0992\ Q^{0.5765}$	WIDTH (FT)
0.5	0.3	49	0.31010	0.71462	4136
1.5	1.0	756	0.04476	0.19714	1141

VELOCITY (FT/SEC)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	$46.0992\ Q^{0.5765}$	WIDTH (FT)
3.5	0.4	68	0.27085	0.66516	3850
4.5	0.6	238	0.13611	0.43540	2520
5.5	0.9	649	0.05423	0.22757	1317
6.5	1.3	1496	0.01626	0.08582	497

MULTIPLE-CHANNEL REGION

SLOPE = 0.0196000
N-VALUE = 0.0300000

ENERGY (FT)	DEPTH (FT)	DISCHARGE (CFS)	PROBABILITY OF DISCHARGE BEING EXCEEDED AT THE APEX BY: Q	0.5765 46.0992 Q	WIDTH (FT)
0.5	0.3	449	0.08068	0.30203	6642

PROBABILITY OF DISCHARGE

(FT/SEC)	(FT)	(CFS)	Q	0.5765 46.0992 Q	(FT)
3.5	0.4	566	0.06397	0.25496	5607

APPENDIX C

HEC-2 MODEL OUTPUT

INCLUDES:

HEC-2 MODEL OUTPUT

WORKMAP

CROSS SECTIONS

APPENDIX C

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**********************************************
*  HEC-2 WATER SURFACE PROFILES              *
*                                            *
*  Version    4.6.2;  May 1991               *
*                                            *
*  RUN DATE    29JAN93    TIME    15:20:50   *
**********************************************
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*****************************************
*  U.S. ARMY CORPS OF ENGINEERS         *
*  HYDROLOGIC ENGINEERING CENTER        *
*  609 SECOND STREET, SUITE D           *
*  DAVIS, CALIFORNIA 95616-4687         *
*          (916) 756-1104               *
*****************************************
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X     X  XXXXXXX   XXXXX             XXXXX
X     X  X        X     X           X     X
X     X  X        X                       X
XXXXXXX  XXXX     X          XXXXX   XXXXX
X     X  X        X                 X
X     X  X        X     X           X
X     X  XXXXXXX   XXXXX            XXXXXXX
```

T1 HEC-2 RUN TO DETERMINE 100-YEAR FLOOD HAZARD LIMITS AND DEPTHS
T2 SOUTHWEST CORNER OF RWMS ASSUMING NO BERM
T3 FLOW CONDITION OF "NATURAL CONDITIONS" FILE: SWCRWMS.DAT
SUBCRITICAL FLOW
CROSS SECTIONS DEVELOPED FROM 1"=400', 5' C.I. TOPOGRAPHIC MAP OF THE RWMS.
THE 100-YEAR DISCHARGE AT CROSS SECTION 1 FROM HEC-1 MODEL RWMSW.OUT (CPF)
IS 2396 CFS. THE REMAINING CROSS SECTIONS (2-7) USED THE 100-YEAR DISCHARGE
OF 1230 CFS FROM HEC-1 MODEL RWMSW.OUT (CPA1).

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	2	0	0	-1	0	0	0	3166	0

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	1	0	-1	0	0	-1	0	0	0	0

NC	0.040	0.040	.035	.1	.3	0	0	0		
QT	1	2396								
X1	1.0	6	0	670	0	0	0			
GR	3175	0	3165	300	3167	340	3165	360	3170	390
GR	3175	670								
QT	1	1229								
X1	2.0	19	445	661	1240	1240	1240			
GR	3180	0	3177.5	420	3177.5	445	3177	446	3176.5	460
GR	3176	461	3176	470	3175.5	471	3175.5	490	3176	491
GR	3176	555	3175	556	3175	590	3176.5	591	3176.5	610
GR	3176	611	3176	660	3178	661	3180	930		
X1	3.0	9	765	821	560	560	560			
GR	3185	0	3181	740	3181	765	3180	766	3180	775
GR	3181	776	3181	820	3182	821	3185	1100		
X1	4.0	3	0	1060	800	800	800			
GR	3190	0	3185	660	3190	1060				
X1	5.0	3	0	1440	1840	1840	1840			
GR	3215	0	3210	770	3215	1440				
X1	6.0	3	0	1130	820	820	820			
GR	3220	0	3215	440	3220	1130				
X1	7	3	0	1150	780	780	780			
GR	3230	0	3225	590	3230	1150				

```
   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


*PROF 1
0

CCHV=      .100 CEHV=      .300
*SECNO 1.000
3720 CRITICAL DEPTH ASSUMED
    1.000      3.18  3168.18   3168.18   3166.00   3169.09       .91       .00       .00   3175.00
   2396.0        .0   2396.0        .0        .0     312.8        .0        .0        .0   3175.00
      .00       .00     7.66       .00      .000      .035      .000      .000   3165.00    204.61
  .015002        0.       0.        0.         0        22         0       .00    174.47    379.08


*SECNO 2.000

3301 HV CHANGED MORE THAN HVINS

    2.000      2.68  3177.68       .00       .00   3177.84       .16      8.67       .08   3177.50
   1229.0       3.6   1225.4        .0       7.0     383.9        .0      10.0       6.3   3178.00
      .11       .52     3.19       .00      .040      .035      .000      .000   3175.00    390.55
  .002669     1240.    1240.     1240.         6         0         0       .00    270.29    660.84


*SECNO 3.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
    3.000      2.30  3182.30   3182.30       .00   3182.70       .40      2.92       .07   3181.00
   1229.0     691.4    532.6       5.1     187.7      82.1       4.1      14.3      10.3   3182.00
      .14      3.68     6.49      1.25      .040      .035      .040      .000   3180.00    500.26
  .014448      560.     560.      560.        20        12         0       .00    348.26    848.52


*SECNO 4.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.19

    4.000      2.17  3187.17       .00       .00   3187.26       .09      4.54       .03   3190.00
   1229.0        .0   1229.0        .0        .0     499.9        .0      21.4      17.7   3190.00
      .23       .00     2.46       .00      .000      .035      .000      .000   3185.00    373.34
  .003005      800.     800.      800.         5         0         0       .00    460.39    833.73


*SECNO 5.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
    5.000      1.34  3211.34   3211.34       .00   3211.69       .35     11.64       .08   3215.00
   1229.0        .0   1229.0        .0        .0     260.3        .0      37.4      35.6   3215.00
      .34       .00     4.72       .00      .000      .035      .000      .000   3210.00    562.95
  .021001     1840.    1840.     1840.        20        14         0       .00    387.21    950.16


*SECNO 6.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.55

    6.000      2.09  3217.09       .00       .00   3217.18       .10      5.47       .03   3220.00
   1229.0        .0   1229.0        .0        .0     494.3        .0      44.6      43.7   3220.00
      .43       .00     2.49       .00      .000      .035      .000      .000   3215.00    255.94
  .003231      820.     820.      820.         8         0         0       .00    472.69    728.63


*SECNO 7.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
    7.000      1.47  3226.47   3226.47       .00   3226.85       .38      5.16       .09   3230.00
   1229.0        .0   1229.0        .0        .0     248.4        .0      51.2      51.0   3230.00
      .47       .00     4.95       .00      .000      .035      .000      .000   3225.00    416.57
  .020478      780.     780.      780.        20        19         0       .00    338.04    754.61


NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST
```

CONDITION OF "NATURAL C

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
*	1.000	.00	.00	.00	3165.00	2396.00	3168.18	3168.18	3169.09	150.02	7.66	312.77	195.62
	2.000	1240.00	.00	.00	3175.00	1229.00	3177.68	.00	3177.84	26.69	3.19	390.85	237.88
*	3.000	560.00	.00	.00	3180.00	1229.00	3182.30	3182.30	3182.70	144.48	6.49	273.88	102.25
*	4.000	800.00	.00	.00	3185.00	1229.00	3187.17	.00	3187.26	30.05	2.46	499.89	224.21
*	5.000	1840.00	.00	.00	3210.00	1229.00	3211.34	3211.34	3211.69	210.01	4.72	260.30	84.81
*	6.000	820.00	.00	.00	3215.00	1229.00	3217.09	.00	3217.18	32.31	2.49	494.33	216.23
*	7.000	780.00	.00	.00	3225.00	1229.00	3226.47	3226.47	3226.85	204.78	4.95	248.41	85.88
*	1.000	2396.00	3168.18	.00	.00	2.18	174.47	.00					
	2.000	1229.00	3177.68	.00	9.50	.00	270.29	1240.00					
*	3.000	1229.00	3182.30	.00	4.62	.00	348.26	560.00					
*	4.000	1229.00	3187.17	.00	4.87	.00	460.39	800.00					
*	5.000	1229.00	3211.34	.00	24.17	.00	387.21	1840.00					
*	6.000	1229.00	3217.09	.00	5.74	.00	472.69	820.00					
*	7.000	1229.00	3226.47	.00	9.38	.00	338.04	780.00					

SUMMARY OF ERRORS AND SPECIAL NOTES

```
CAUTION SECNO=      1.000  PROFILE=  1  CRITICAL DEPTH ASSUMED

CAUTION SECNO=      3.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      3.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      3.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

WARNING SECNO=      4.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=      5.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      5.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      5.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

WARNING SECNO=      6.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=      7.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      7.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      7.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL
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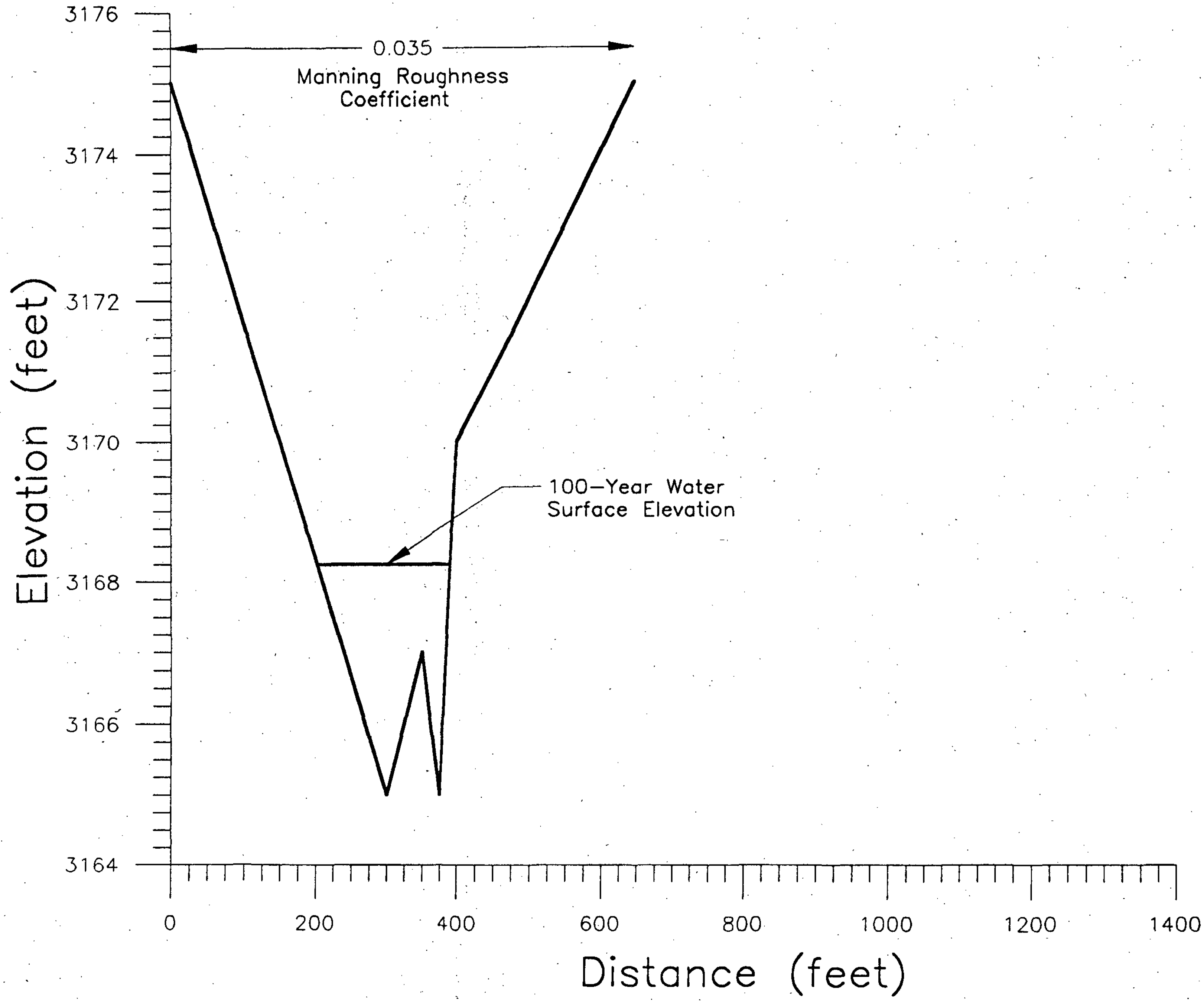
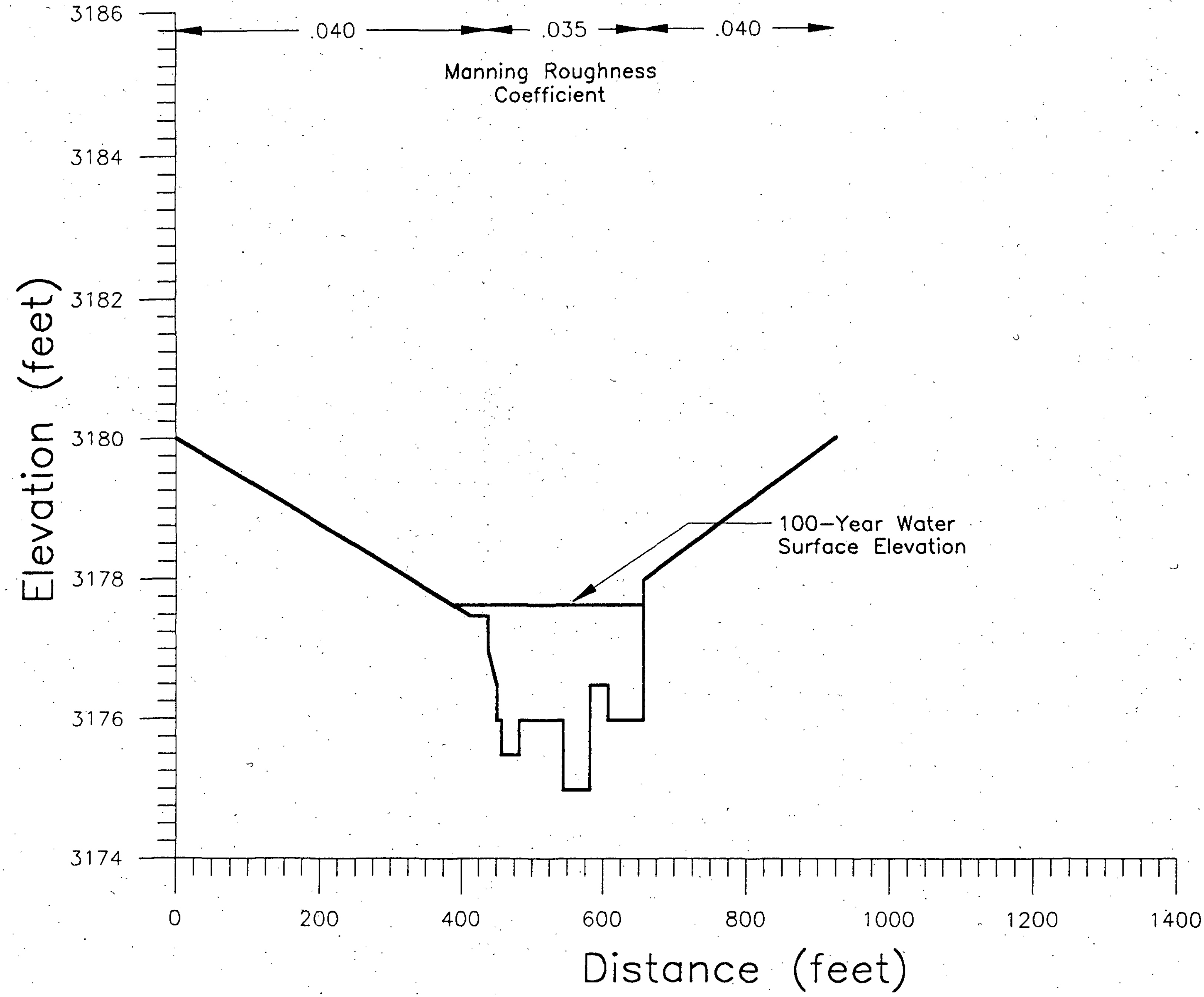
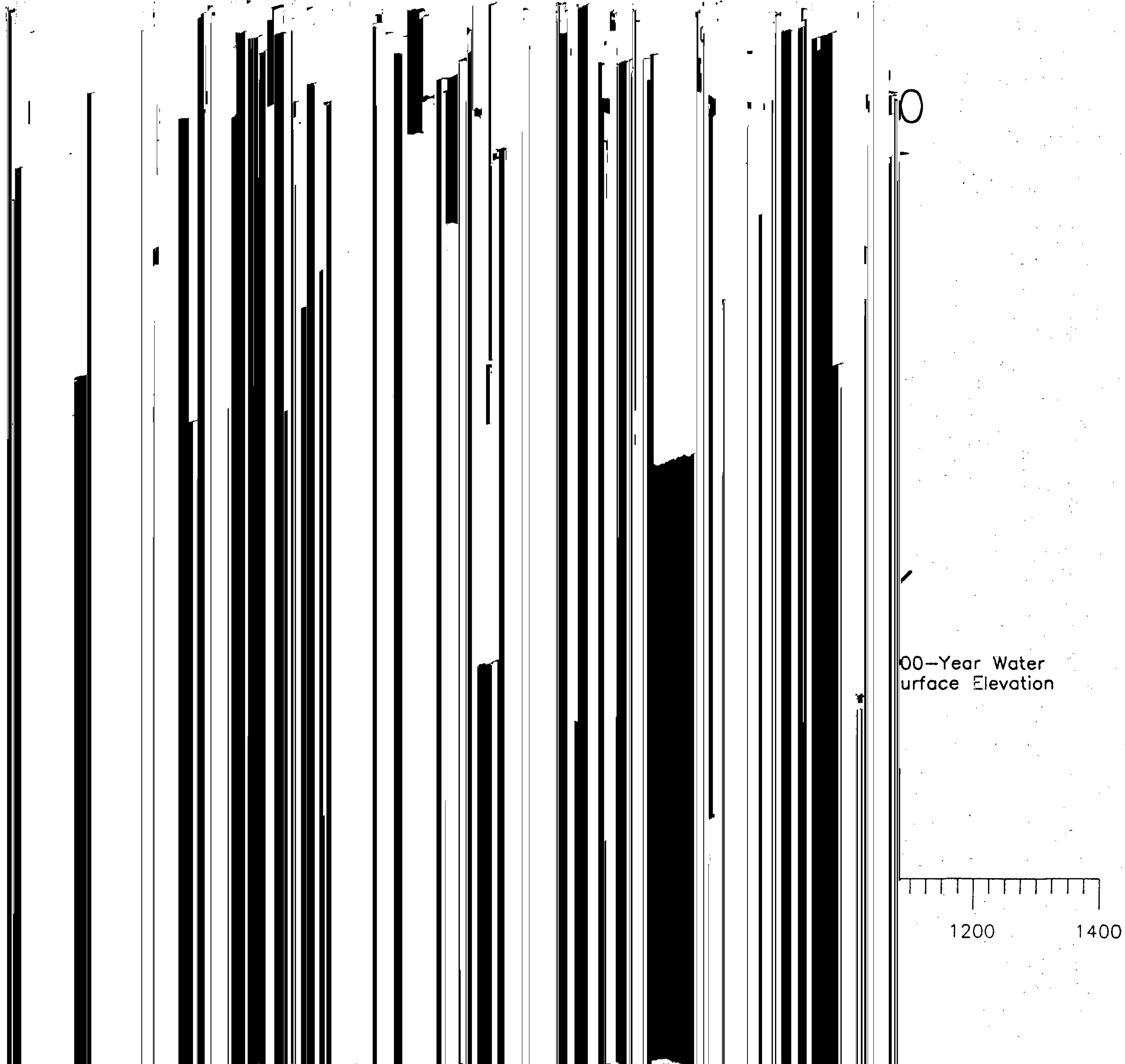
Cross-Section 1.000



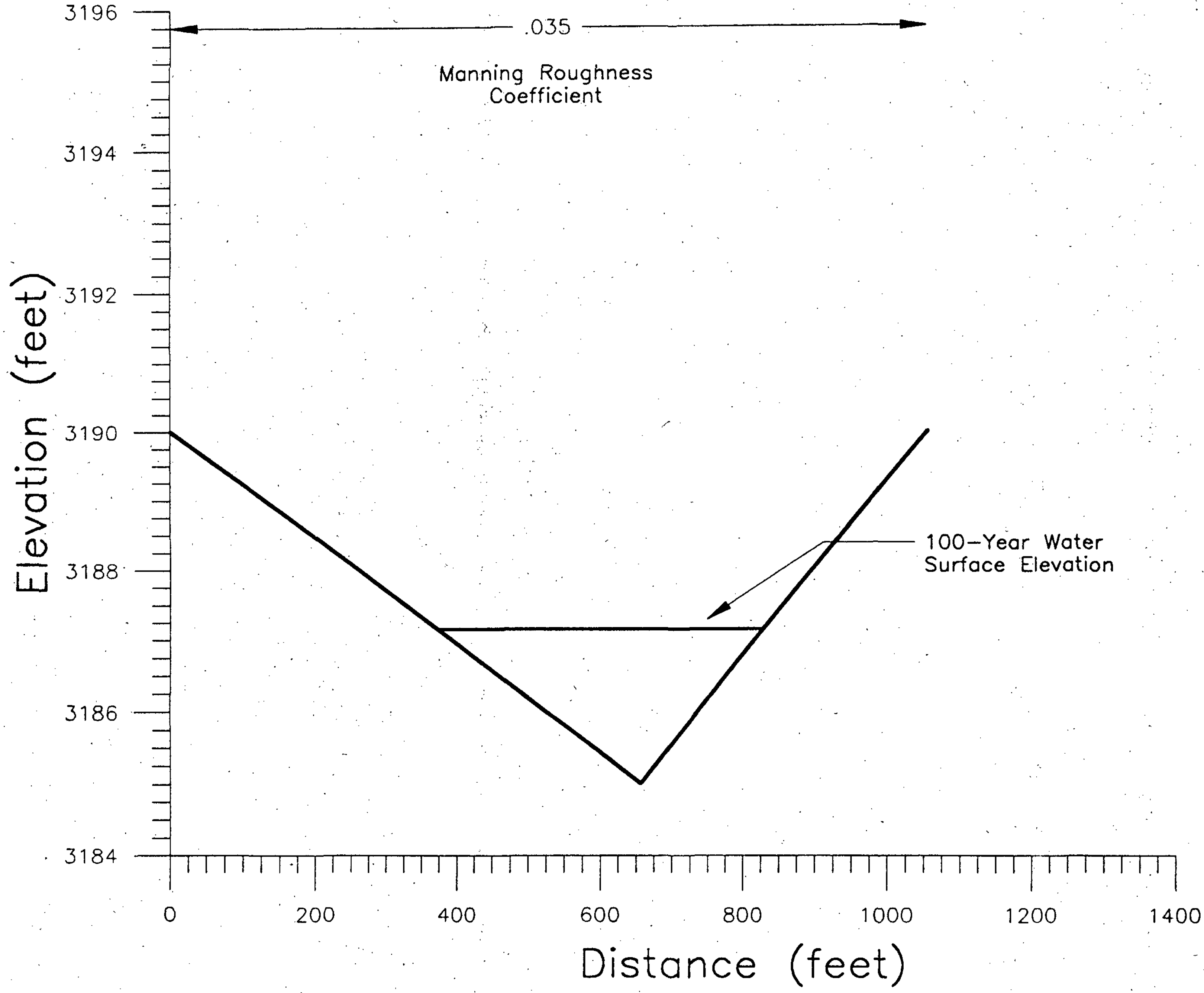
Cross-Section 2.000





00-Year Water
urface Elevation
1200
1400

Cross-Section 4.000



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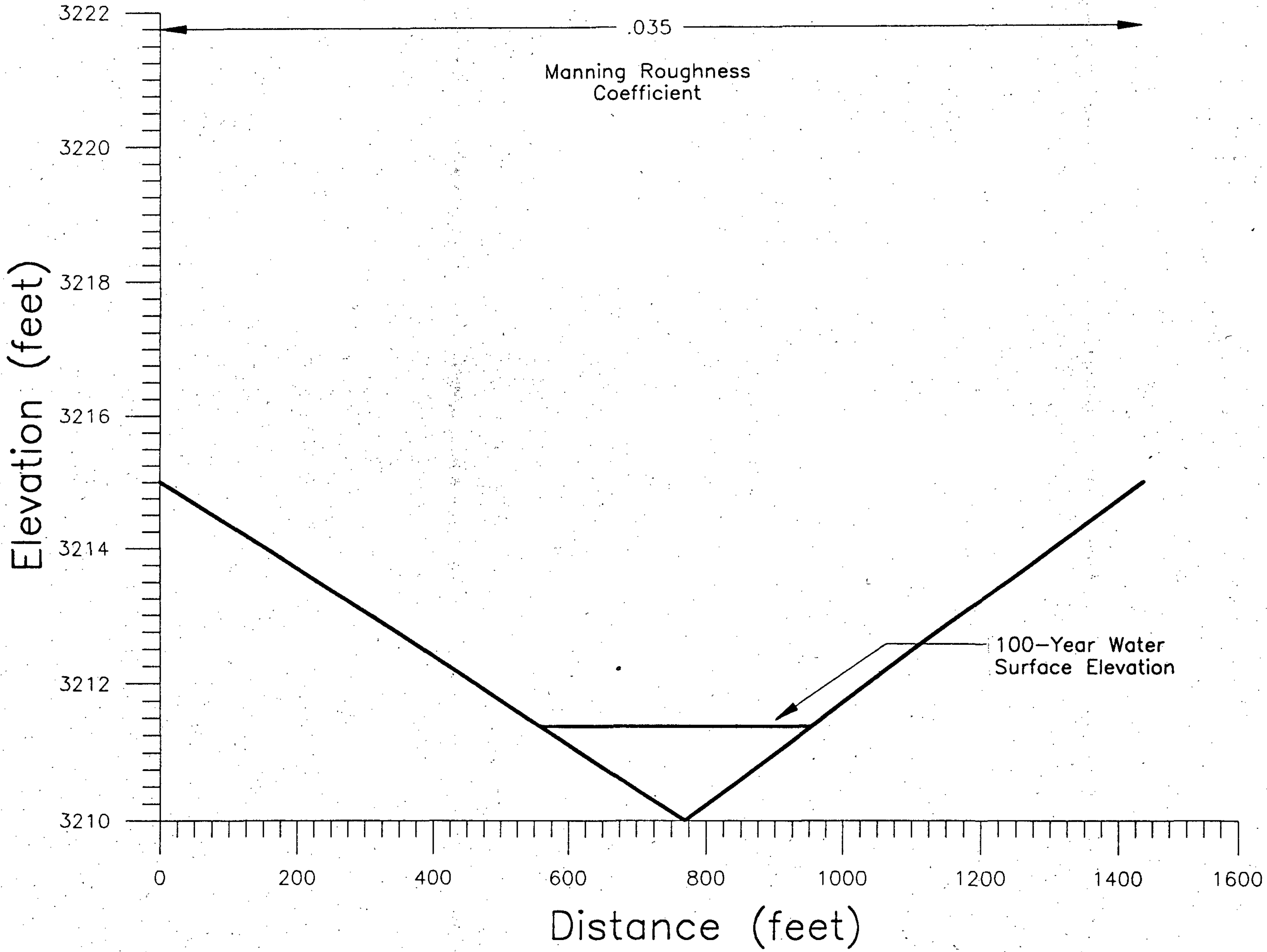

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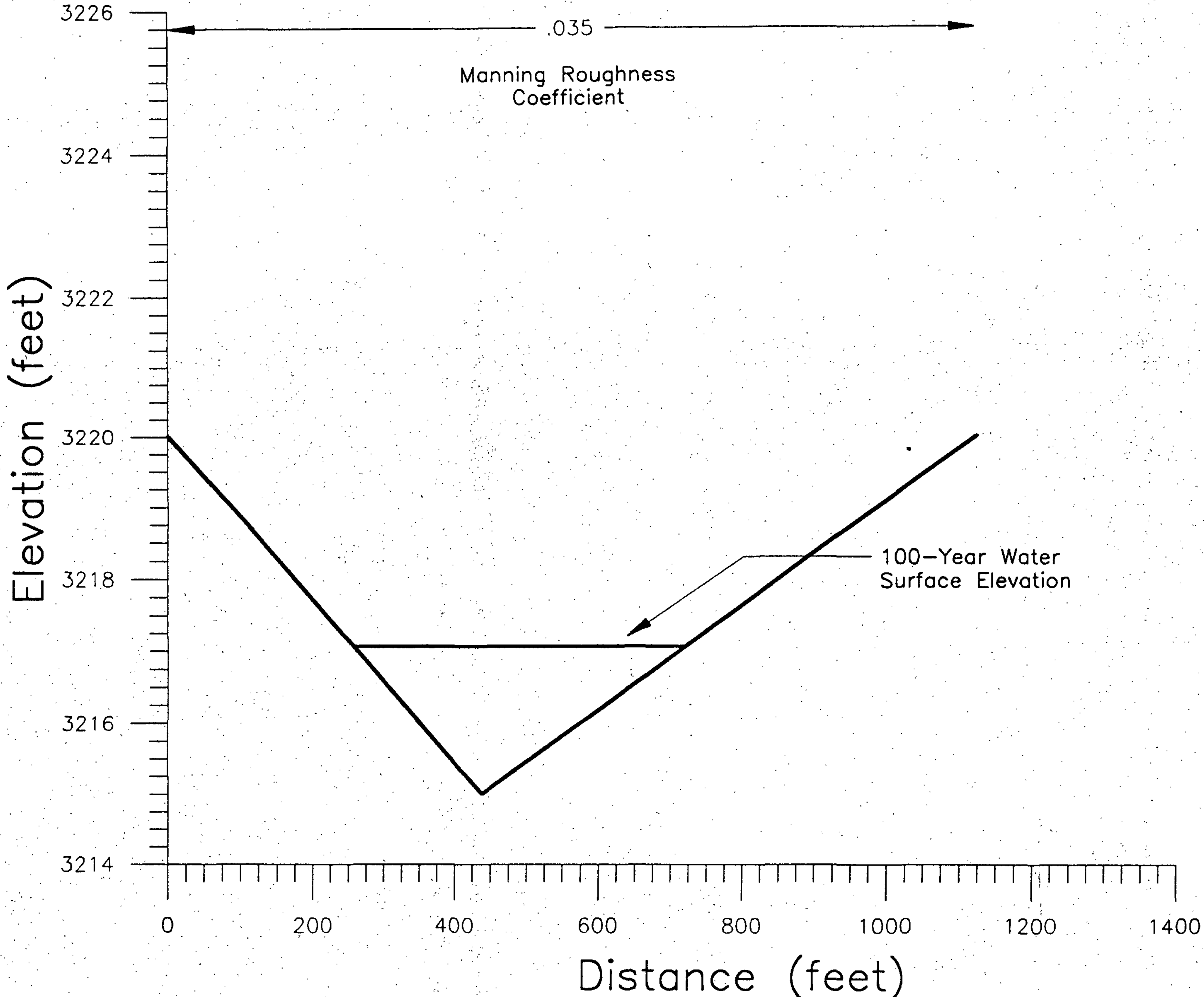
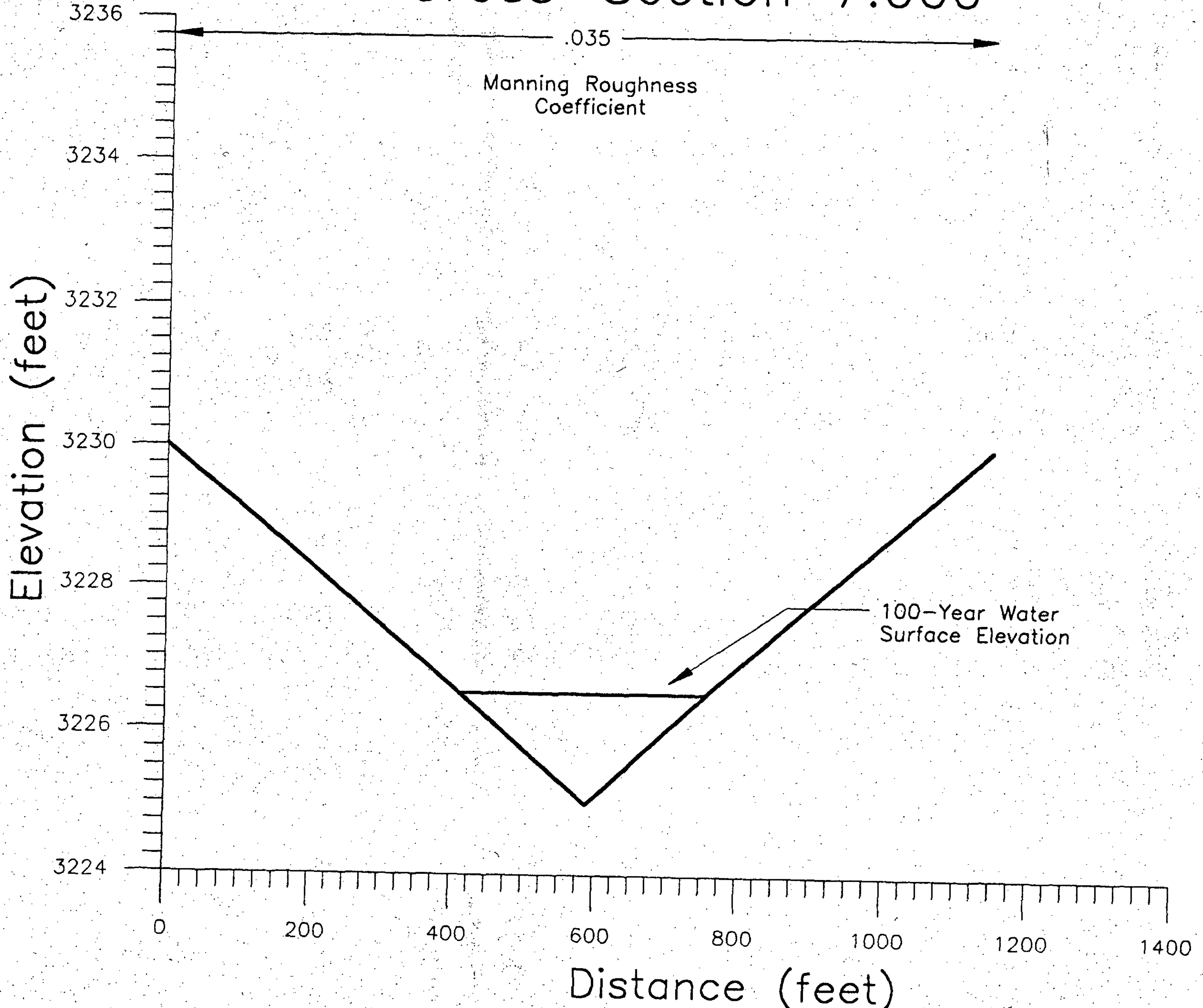


Cross-Section 7.000



APPENDIX D

SHEETFLOW CALCULATIONS

SHEETFLOW CALCULATIONS ALONG THE NORTH, EAST AND WEST BOUNDARIES OF THE AREA 5 RWMS.

SHEETFLOW CALCULATIONS FOR THE NORTH SIDE OF THE AREA 5 RWMS

CHANGE IN ELEVATION (ft)	REACH LENGTH (ft)	MANNING COEFFICIENT	SLOPE (ft/ft)	WIDTH (ft)	DISCHARGE (ft^3/sec)
90	3500	0.035	0.026	2500	624

Q=DISCHARGE (ft^3/sec)
V=VELOCITY (ft/sec)
A=AREA (ft^2) (For a rectangular channel, area = depth * width)
R=HYDRAULIC RADIUS (ft) (For a shallow channel, assume R=depth)
S=SLOPE (ft/ft)
n=MANNING COEFFICIENT
W=WIDTH (ft)
d=DEPTH (ft)

EQUATIONS:

$$Q=VA$$

$$V=\frac{1.49}{n}R^{2/3}S^{1/2}$$

$$Q=\frac{1.49}{n}R^{2/3}S^{1/2}A$$

CALCULATIONS:

$$Q=\frac{1.49}{n}d^{2/3}S^{1/2}dW$$

$$Q=\frac{1.49}{n}d^{5/3}S^{1/2}W$$

$$d=\frac{Qn}{(1.49S^{1/2}W)^{3/5}}$$

DEPTH CALCULATION:

FLOW DEPTH = 0.11 ft

SHEETFLOW CALCULATIONS FOR THE EAST SIDE OF THE AREA 5 RWMS

CHANGE IN ELEVATION (ft)	REACH LENGTH (ft)	MANNING COEFFICIENT	SLOPE (ft/ft)	WIDTH (ft)	DISCHARGE (ft^3/sec)
75	4250	0.035	0.018	2460	1100

Q=DISCHARGE (ft^3/sec)
V=VELOCITY (ft/sec)
A=AREA (ft^2) (For a rectangular channel, area = depth * width)
R=HYDRAULIC RADIUS (ft) (For a shallow channel, assume R=depth)
S=SLOPE (ft/ft)
n=MANNING COEFFICIENT
W=WIDTH (ft)
d=DEPTH (ft)

EQUATIONS:

$$Q=VA$$

$$V=\frac{1.49}{n}R^{2/3}S^{1/2}$$

$$Q=\frac{1.49}{n}R^{2/3}S^{1/2}A$$

CALCULATIONS:

$$Q=\frac{1.49}{n}d^{2/3}S^{1/2}dW$$

$$Q=\frac{1.49}{n}d^{5/3}S^{1/2}W$$

$$d=\frac{Qn}{(1.49S^{1/2}W)^{3/5}}$$

DEPTH CALCULATION:

FLOW DEPTH = 0.22 ft

SHEETFLOW CALCULATIONS FOR THE WEST SIDE OF THE AREA 5 RWMS

CHANGE IN ELEVATION (ft)	REACH LENGTH (ft)	MANNING COEFFICIENT	SLOPE (ft/ft)	WIDTH (ft)	DISCHARGE (ft^3/sec)
100	3500	0.035	0.029	2780	450

Q=DISCHARGE (ft^3/sec)
V=VELOCITY (ft/sec)
A=AREA (ft^2) (For a rectangular channel, area = depth * width)
R=HYDRAULIC RADIUS (ft) (For a shallow channel, assume R=depth)
S=SLOPE (ft/ft)
n=MANNING COEFFICIENT
W=WIDTH (ft)
d=DEPTH (ft)

EQUATIONS:

$$Q=VA$$

$$Q=\frac{1.49}{n}R^{2/3}S^{1/2}A$$

CALCULATIONS:

$$Q=\frac{1.49}{n}d^{2/3}S^{1/2}dW$$

$$Q=\frac{1.49}{n}d^{5/3}S^{1/2}W$$

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